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APRIL 1989, VOLUME 29, NUMBER 4

LANDSCAPE MANAGEMENT

30 COVER STORY: TRIMMERS COME OF AGE
By Jay Holtzman, contributing editor. You've got to look at small differences in string trimmers to find the one best suited to your work.

38 WARM-SEASON INSECT CONTROL GUIDE
by Pat Cobb, Ph.D. The dry summer and mild winter means that southern turf managers can expect a fierce battle on their hands this year.

48 COOL-SEASON INSECT CONTROL GUIDE
by Harry Niemczyk, Ph.D. The good news is that the drought last summer reduced grub populations. The bad news is that chinch bugs will pick up the slack.

60 THE POLITICS OF WATER
by Terry McIver. As drought possibilities loom, legislators and industry associations vie for equitable distribution of good ol' H_2O.

66 NO SPEED LIMIT
by Karl Danneberger, Ph.D. Despite what club members might say, there's more to a quality green than speed. Here are some management tips to keep your greens looking good.

72 THE SEARCH FOR ZOYSIAGRASS
by Judy and Doug Brede, Ph.D. There's no limit to what researchers will do to find zoysiagrass. And there's no limit to what it might do for you.

80 THE VANDALISM GAME
by Will Perry. Even the most well-managed facilities are at the mercy of vandals. Though you can't always stop them, there are steps you can take can make them think twice.

84 STARTING MOWERS
It's time to put away your snowthrowers and prepare your mowers. A couple hours of work now will make sure each is ready when you are.

DEPARTMENTS

3 As I See It . . .
8 Green Industry News
14 Short Cuts
88 Business Management
90 Jobtalk
94 Insurance Insights
99 New Products
102 Classified
114 Ad Index
116 Problem Management

LM Editorial Staff

Jerry Roche
Editor

Will Perry
Mg. Editor

Terry McIver
Assoc. Editor

LM Editorial Advisory Board

Doug Chapman
Horticulturist
Dow Gardens
Midland, MI

J.R. Hall
Extension Agronomist
VPI & SU
Blacksburg, VA

Kent Kurtz
Professor
Horticulture
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Harry Niemczyk
Professor
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Wooster, OH

A. Marty Petrovic
Assoc. Professor
Cornell University
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Robert Shearman
Assoc. Professor
University of Nebraska
Lincoln, NE

LANDSCAPE MANAGEMENT (ISSN 0894-1254) is published monthly by Edgell Communications, Inc. Corporate and Editorial offices: 7500 Old Oak Boulevard, Cleveland, Ohio 44130. Advertising Offices: 7500 Old Oak Boulevard, Cleveland, Ohio 44130, 111 East Wacker Drive, Chicago, Illinois 60601 and 3091 Maple Drive, Atlanta, Georgia 30305. Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: $25 per year in the United States: $50 per year in Canada. All other countries: $100 per year. Single copies (pre-paid only): $2.50 in the U.S.; $5.00 in Canada; elsewhere $10.00; add $3.00 for shipping and handling per order. Office of publication: Edgell Communications, Inc., 1 East First Street, Duluth, Minnesota 55802. Second class postage paid at Duluth, Minnesota 55806 and additional mailing offices. Copyright© 1989 by Edgell Communications, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

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AS I SEE IT...

My, how things change!

I can remember it as yesterday.

During the November, 1982 convention of the Professional Lawn Care Association of America (PLCAA) in Indianapolis, at least two farsighted people actually mentioned pesticide regulations in seminars. Jerry Faulring and Don Burton, PLCAA past president and future president, respectively, were the first to warn us of pending legislation. At the time, though, not many people were listening.

One of the earliest headlines I ever wrote for the green industry was this one: "Environmentalists: A threat to the industry's survival." It went on top of a *Lawn Care Industry* article bylined by Faulring, the first really in-depth article concerning the "environ-emotionalists" to appear in a trade magazine.

Next to that article appeared another headline that read "Pesticide applicators now united." It concerned the beginning of what is now the Pesticide Public Policy Foundation (PPPF).

Since those August, 1983 articles in LCI, the lawn care industry hasn't yet come full circle. The "environ-emotionalists" are still out there, and still trying to get legislators to pass silly laws limiting the effectiveness of urban pesticide applicators.

But now, in 1989, the green industry has some excellent organizations in place to combat the misinformation that has, in the past, been promulgated by the "other side." Jim Brooks, a salesman for LCI and LANDSCAPE MANAGEMENT back in 1982, is executive vice president of the PLCAA. Jim Wilkinson, who worked for Old Fox Lawn Care back then, is now executive director of the PPPF. Then there are Bob Felix of the National Arborists Association (NAA) and Harvey Gold of the National Pest Control Association (NPCA), both active proponents of judicious, safe use of urban pesticides.

Have I forgotten somebody? Of course. There are many more active green industry businessmen out there on the state level. And it would behoove each and every one of you to get active at the state and local levels, if not personally at least monetarily.

But the point is, that as pesticide laws move inward to the heart of America from both coasts, machinery is in place to make certain that the green industry gets—at the very least—an even break from our legislators.

It wasn't like that back in 1982.

Jerry Roche

Jerry Roche, editor

EDITORIAL STAFF

Jerry Roche, Editor
Will Perry, Managing Editor
Terry McIver, Associate Editor
Office: 7500 Old Oak Blvd.
Cleveland, OH 44130
(216) 243-8100
FAX (216) 826-2832

MARKETING STAFF

Dick Gore, Publisher
Office: 455 E. Paces Ferry Rd.
Suite 324
Atlanta, GA 30305
(404) 233-1817
FAX (404) 261-7022

Jon Miducki, National Sales Manager
Marsha Dover, Midwest Sales Manager
Gloria Cosby, Eastern Sales Manager
Bob Earley, Group Vice President
Office: 7500 Old Oak Blvd.
Cleveland, OH 44130
(216) 243-8100
FAX (216) 826-2832

Robert Mierow, W. Coast Representative
Office: 1515 NW 51st Street
Seattle, WA 98107
(206) 783-0549
FAX (206) 784-5545

Tom Greney, Senior Vice-President
Office: 111 East Wacker Drive
Chicago, IL 60601
(312) 938-2317
FAX (312) 938-4850

SUPPORT STAFF

Carol Peterson, Production Mgr.
Marilyn MacDonald, Prod. Supervisor
Lynn Williams, Graphic Design
Jackie Eisenmann, Circulation Super.
Bonnie DeFoe, Directory Coordinator
Gail Parenteau, Reader Service Mgr.
Office: 120 West Second St.
Duluth, MN 55802
(218) 723-9200
FAX (218) 723-9223

David Komitau, Graphics Coordinator
Ted Matthews, Promotion Director
Office: 7500 Old Oak Blvd.
Cleveland, OH 44130
(216) 243-8100

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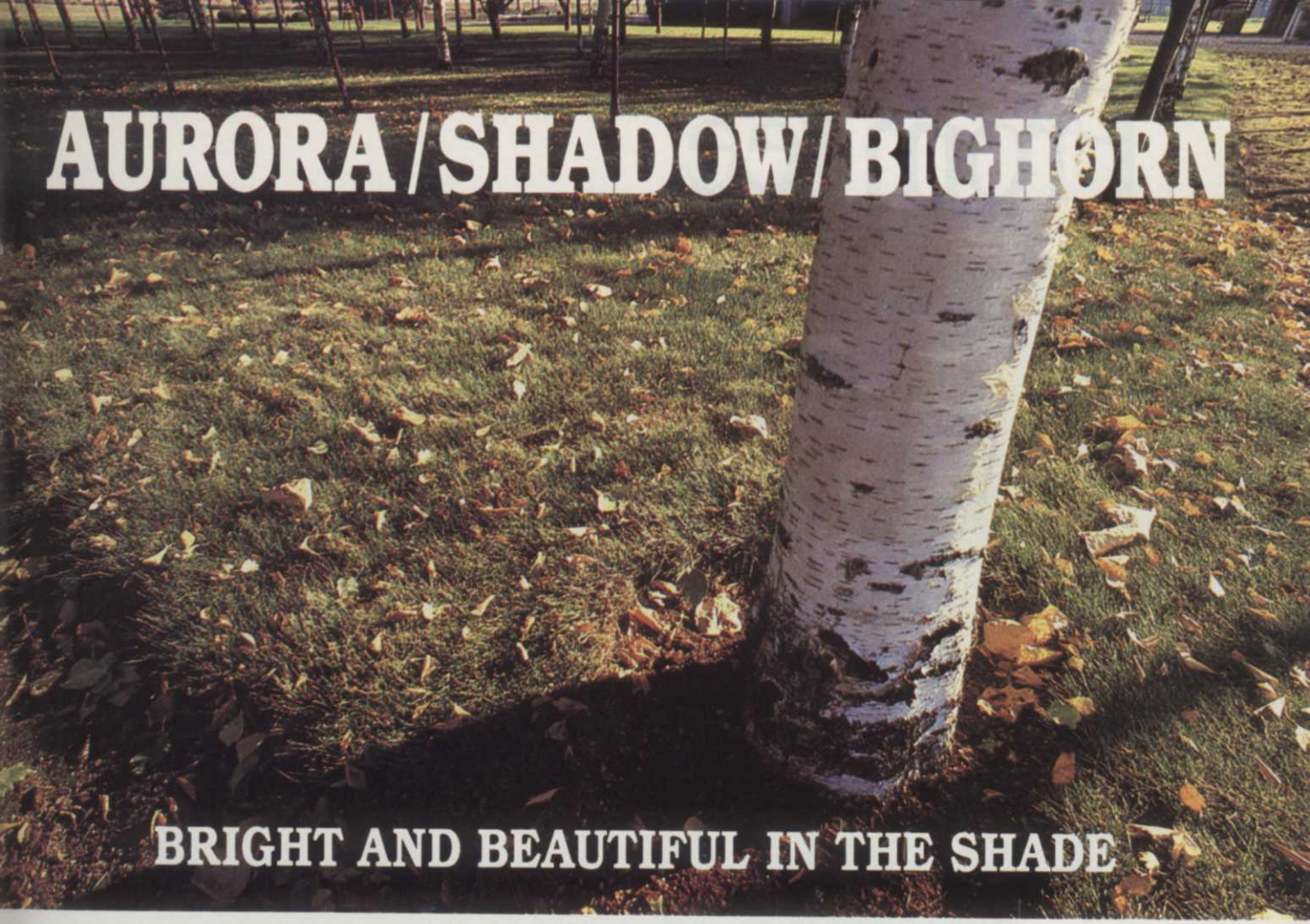

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to green.

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Chipco® 26019
Fungicide

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LANDSCAPE MANAGEMENT
APRIL 1989, VOLUME 30, NUMBER 4

GREEN INDUSTRY NEWS

INDUSTRY

'Scapers see growth in '89

WASHINGTON — Though expansion wasn't as great as it was in 1987, landscapers did meet their 1988 expectations and remain optimistic about increasing business in 1989, according to results of the 14th annual Landscape Business Survey by the National Landscape Association (NLA).

Work that accounted for the greatest sales increase in 1988 included residential renovation (+69%) and new commercial landscaping (+60%). This year, 84 percent of those polled said they expect new residential landscaping sales to increase, followed by residential renovation (+78%).

Last year NLA members predicted a 13.9 percent increase in business and enjoyed actual expansion of 13.7 percent. This year they are looking to grow by as much as 14.3 percent.

The table at right illustrates regional variations as well as overall averages from the NLA survey. □

NLA December 1988 Business Survey

The accompanying tables show regional variations, as well as the overall averages from the current survey.

	1988				1989			
Region	% Up	Reporting Same	Down	%Change Reported-88/87	% Up	Reporting Same	Down	%Change Expected-89/88
NEW RESIDENTIAL LANDSCAPING								
Northeast	86	4	10	+11.9	88	7	5	+15.8
Southeast	64	18	18	+ 9.9	73	21	6	+ 9.1
Great Lakes	78	7	15	+11.9	90	10	0	+13.3
Great Plains	67	12	21	+ 5.4	86	10	4	+ 8.9
Survey Avg.	**74%**	**9%**	**17%**	**+10.1%**	**84%**	**12%**	**4%**	**+12.2%**
NEW COMMERCIAL LANDSCAPING								
Northeast	58	19	23	+12.5	65	19	16	+11.1
Southeast	56	25	19	+ 7.8	71	23	6	+11.1
Great Lakes	71	18	11	+10.2	78	15	7	+10.5
Great Plains	50	12	38	+ 2.3	59	18	23	+ 1.6
Survey Avg.	**60%**	**19%**	**21%**	**+ 9.2**	**70%**	**18%**	**12%**	**+ 9.0**
RESIDENTIAL RENOVATION								
Northeast	73	17	10	+11.6	78	22	0	+12.1
Southeast	67	23	10	+10.7	73	27	0	+11.4
Great Lakes	70	23	7	+11.3	85	15	0	+10.8
Great Plains	72	17	11	+ 7.8	88	12	0	+11.2
Survey Avg.	**69%**	**21%**	**10%**	**+10.7%**	**78%**	**21%**	**1%**	**+11.0%**
COMMERCIAL RENOVATION								
Northeast	28	64	8	+2.5	53	43	4	+6.8
Southeast	36	50	14	+4.8	45	55	0	+7.1
Great Lakes	45	49	6	+4.7	52	45	3	+5.4
Great Plains	20	30	50	−3.0	60	40	0	+5.5
Survey Avg.	**36%**	**50%**	**14%**	**+3.2%**	**50%**	**47%**	**3%**	**+5.8%**
RESIDENTIAL LANDSCAPE MAINTENANCE								
Northeast	68	24	8	+12.2	59	29	12	+ 9.7
Southeast	50	46	4	+16.7	45	45	10	+ 7.0
Great Lakes	61	32	7	+ 7.2	70	30	0	+ 6.1
Great Plains	83	17	0	+ 9.1	80	10	10	+ 7.5
Survey Avg.	**63%**	**31%**	**6%**	**+11.8%**	**61%**	**32%**	**7%**	**+7.9%**
COMMERCIAL LANDSCAPE MAINTENANCE								
Northeast	48	48	4	+11.4	62	38	0	+17.8
Southeast	71	17	12	+12.5	80	20	0	+16.2
Great Lakes	56	41	3	+ 6.6	61	36	3	+ 5.5
Great Plains	50	40	10	+ 5.0	60	30	10	+ 4.5
Survey Avg.	**56%**	**36%**	**8%**	**+10.2%**	**65%**	**31%**	**4%**	**+11.5%**

Source: NLA

LAWN CARE

PLCAA says it will add to staff

MARIETTA, Ga. — The Professional Lawn Care Association of America (PLCAA) is moving ahead with plans to hire a communications specialist and a director of state government affairs. The goal is better relations between PLCAA, its members and state

lawmakers.

"We anticipate that with more activity in the area of issues management, we're going to need someone to help us in terms of better communication with members and all kinds of allied groups," says Jim Brooks, executive vice president, regarding the communications specialist post.

The specialist will assist existing staff, particularly in the production of the association newsletter, and communication with member chapters on issues related matters.

Brooks said the state affairs position was created so that PLCAA can have someone to focus on regulatory matters. The director will monitor state legislative and regulatory activities relative to the lawn care industry and recommend and coordinate PLCAA's response to those activities.

Brooks said the state affairs director job would most likely be filled first. The communications specialist position should be filled by June. □

TURFGRASS

U of C releases zoysia research

RIVERSIDE, Calif. — The new zoysiagrasses are a truly minimum maintenance turf variety that grows best when planted by stolon. In addition, its slow root regrowth is a bigger problem than phytotoxicity following pre-emergence herbicide application, according to researchers at the University of California here.

Results from a preliminary study of nitrogen fertilization of the new zoysiagrass El Toro tend to confirm its potential as a minimum maintenance turfgrass.

"When unfertilized or fertilized at a low level, the El Toro zoysiagrass produced a sward of poor color but one of adequate density and fairly pleasing appearance," reports Vic Gibeault, Ph.D., cooperative extension environmental horticulturist. Minimum maintenance turf of decent density and appearance resulted with low nitrogen applications, he added, while moderate to high nitrogen treatments resulted in a sward of deep green color, high density and overall turf quality.

A second study conducted in Irvine by J. Michael Henry shows stolon planting to be the best way and mid-June the best time for planting and establishing El Toro in Southern California.

Grasses planted with stolons established much faster with summer and spring planting times than those grasses planted by the plug method, according to Henry. There was little difference in establishment between the two planting methods for grasses planted in the fall.

continued on page 14

LEGISLATION

New law: trouble in California

SACRAMENTO, Calif. — The legislative juggernaut continues to roll in California. The latest episode in the state's ongoing efforts is S.B. 2126, which states that after January 1, 1990, no public agency may apply an herbicide or pesticide without written recommendation by a licensed "pest control advisor." Public agencies are any facilities funded by taxpayers.

According to John Ford of Contra Costa County, agencies have one year to "grandfather in" the bill's requirements. That means certain educational requirements will be waived for those who have been advising for the past few years.

Stan Strew, executive director of the California Agricultural Producers Association (CAPA), said advisor applicants must have a high school diploma and at least two years practical experience within the individual agency. CAPA sponsored the bill, which is predicated on the fact that public agencies are up front in the public eye, particulary those in the highway department. According to Strew, the California Department of Transportation (Caltrans) recently went through numerous lawsuits brought on by improper, non-supervised applications.

If S.B. 1226 is vigorously enforced, it could affect the operations of herbicide applicators. According to Ford, 40 percent of all herbicides brought into California are used by public agencies. □

SOD

Sod companies get wise to market

SAN DIEGO — Many of the secrets to success in the sod business are based on close attention to basic market indicators and the size of the bottom line.

Companies have become more careful than ever in the attention they pay to housing starts, interest rates and size of inventory.

"We as an industry have become more cautious due to the ups and downs," says Jim Huggett of Long Island Farm, Marshall, Wis.

"You know you're in a downturn," says Huggett, "when you look out the window day after day and see that you're doing the same amount of mowing, and you realize your bottom line is stagnant. It almost catches you by surprise."

Huggett and other sod producers believe strongly in the interest rate as an accurate prophet, due to its affect on housing starts.

"We as produceers can and should do our homework, says Huggett. Get in contact with customers, builders, and read the Dodge reports.

Larry Smilsky of Cookstown, Ontario, Canada, held off on certain land lease renewals during a recent slowdown to be on the safe side, and also engaged in some "general belt tightening."

When it comes to expansions or sudden upswings in business, Smilsky acts strictly by demand, and is careful not to forget his most loyal customers in the heat of battle.

"Over the short term it's better, of course, to have extremely high demand," he admits. "But over the long term, your (oldest) customers expect you to be there to take care of them." □

Workers on a sod farm harvest the product.

With virtually endless varieties of colorful woody ornamentals now available in nurseries, many landscapers are purposely creating Dyclomec-safe beauty spots such as the one above. Photos on the right show how Dyclomec can turn a fence line into a landscaping highlight.

How to improve your efficiency in managing landscape beauty spots

Nothing says as much about a landscaper's expertise as the appearance of ornamental beds, fence lines, tree wells, etc. Learn how Dyclomec® Landscaping Herbicide can help keep these beauty spots weed-and-grass-free for considerably less money than you are now spending.

In recent years, the usage of Dyclomec has increased at an unprecedented rate as more and more landscapers have learned from direct experience what a labor-saving, cost-saving chemical tool it is.

And now, it is your turn to discover how you can use Dyclomec to keep problem areas such as fence lines, tree wells, ornamental beds, etc. free from weeds and grasses. Of course, you know how important this is, because the most neatly manicured turf and beautifully trimmed ornamentals are wasted if your landscaping highlights are spoiled by an ugly growth of weeds and grass.

Perhaps you've tried a contact herbicide only to find that the vegetation grows right back. Perhaps you've tried a flower-safe pre-emerge, only to find that it runs out of gas long before the season is over, and that its narrow spectrum misses the very weeds and grasses you need to control.

Broad-spectrum strength. In desperation you may have gone back to your string trimmer and a hoe. But cheer up — because this is the year you discover Dyclomec.

Indeed Dyclomec's active ingredient is unique in all the world. No other chemical is so versatile and so helpful to the landscaper.

It's *both* post-emerge and pre-emerge; it controls *both* grasses and broadleaves, even such toughies as quackgrass and spurge; it controls *both* annuals and perennials; it has the broadest spectrum of any pre-emergent in the world; one treatment lasts all season and then totally biodegrades.

What is Dyclomec — how does it work?

The active ingredient in Dyclomec is dichlorobenzonitrile. We mill it into razor-thin crystals and incorporate it into a special granule that our researchers developed in 1985.

You simply spread the granules on any precise area you want to keep clean. You can put the granules down over existing weeds and grasses or you can put them down over

Schematic drawings show why Dyclomec works where conventional (flower-safe) pre-emerges fail.

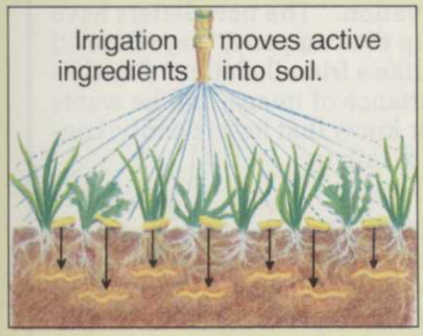
Flower-safe pre-emergent herbicides in some instances have to be present in adequate strength before germination occurs. Such herbicides simply will not knock out weeds after they germinate.

Furthermore, these flower-safe pre-emergents are broken down by light and microbial action and thus begin to lose strength from the very first day they are applied.

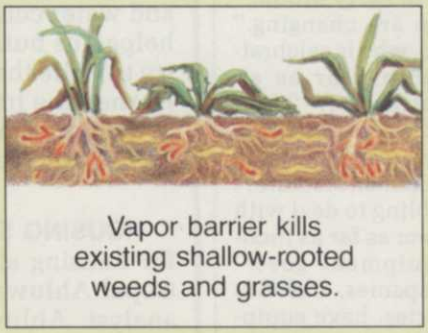
Seeds, of course, can germinate almost anytime during the year, depending on the weather and the weed or grass species. Thus it is that many seeds can germinate past the efficiency period of the pre-emerge — or could have germinated before the pre-emerge is applied. It's a narrow window at best, and characteristically the spectrum of a pre-emerge that stops germination is relatively limited.

Of course, these flower-safe pre-emergents have no effect at all on existing weeds (that's why it's safe to spray them over flowers). Accordingly, to clean up a landscape beauty spot, it is necessary to kill existing vegetation with a contact herbicide. Or clean it out by hand.

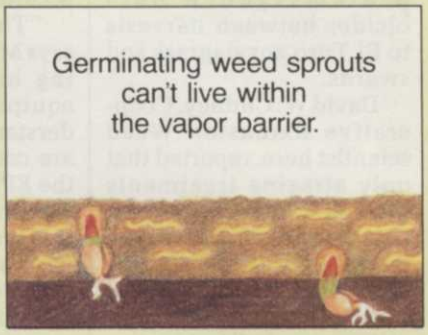
Now . . . take a minute to study the schematic drawings on this page that delineate the remarkable activity of Dyclomec . . . then, as a professional, ask yourself if you shouldn't at least give Dyclomec a trial.



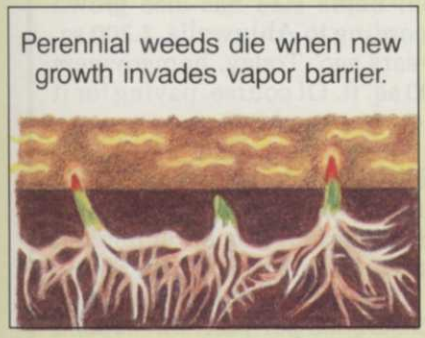
Dyclomec granules are spread in areas you wish to keep clean from weeds and grasses. It is all right to spread them over existing vegetation if you want to kill it. Water moves the active ingredient into the top 2 or 3 inches of the soil, where it forms a vapor barrier that kills meristematic tissue.



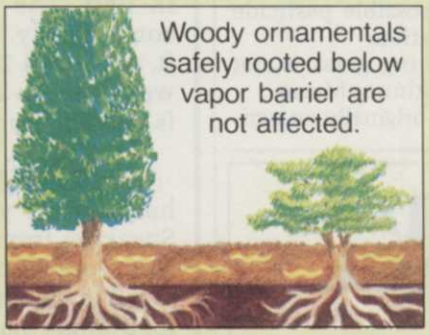
Dyclomec kills all existing weeds and grasses because their tender roots are in the vapor barrier. Even such toughies as quackgrass, crabgrass, Bermudagrass, spurge, oxalis and ground ivy will die when their roots are exposed to the Dyclomec vapor barrier, resulting in beautifully weed-free grounds all season long.



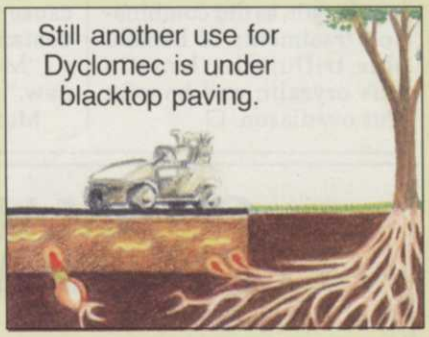
Weed seeds either in or below the vapor barrier cannot emerge because the barrier kills their meristematic tissue. And, since Dyclomec gives season-long control, there is no critical time table as to when it must be applied. Do it at your convenience, confident that the treatment will be effective.



Perennials coming out of dormancy die when their new sprouts hit the barrier. Likewise, creeping grasses like Bermuda are pruned back when they try to invade the vapor barrier. So long as the Dyclomec vapor barrier is present, you can be sure that the area is going to be free of weeds and grasses.



Woody ornamentals that have roots below the vapor barrier are unaffected. Because of this, many landscapers deliberately plan their "beauty spots" to contain colorful, woody ornamentals that are Dyclomec-safe. The overall beauty is enhanced and the maintenance cost is reduced.



Blacktop cart paths that are underlaid with Dyclomec will not have weeds poking through their surface nor shallow roots invading from below and threatening to buckle the blacktop. Of course, this is also true of areas that are covered with gravel or pebbles, or even cobblestones or bricks.

bare ground, or bark, or mulch or pebbles. The herbicide can work its way down through any kind of groundcover that weeds can work their way up through. All you need to do is be sure it is incorporated into the soil. So, in most instances, the best thing to do after spreading it is to sprinkle it in with irrigation.

The herbicide will penetrate into the top layer of soil and form a vapor barrier approximately 2 to 3 inches deep. This vapor barrier is not water soluble so it has very little lateral movement.

The vapor barrier kills meristematic tissue, and thus no shallow-rooted plants can live in it. No newly germinated seeds can live in it, and no perennial shoots coming up from dormancy can penetrate it. And yet existing, deep-rooted woody ornamentals are completely safe.

And here's the really good news! It lasts all season long, and then totally biodegrades.

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719-289

EL TORO *from page 11*

A third study, also conducted at the university's Riverside facility, showed that sod producers need to be more concerned about slow root regrowth than phytotoxicity when applying some commonly-used pre-emergence herbicides between harvests to El Toro zoysiagrass sod swards.

David W. Cudney, Cooperative Extension Weed scientist here, reported that only atrazine treatments showed a color reduction. Oxadiazon and atrazine treatments didn't significantly reduce root length. Benefin, at its lower application rate of 3 lbs. Ai/acre, resulted in slight reduction in root length. The high rate of benefin and both rates of bensulide, pendimethalin and prodiamine reduced root length, as did combination treatments of benefin plus trifluralin, benefin plus oryzalin and benefin plus oxadiazon. □

DISTRIBUTORS

Dealer says industry faces important issues

NORTH RIDGEVILLE, Ohio — The green industry has some important issues to face in the coming years, according to Larry Munn.

"Things are changing," says Munn, who is celebrating his 30th year as an equipment dealer. "I understand the grass clippings are causing problems with the EPA. So manufacturers are scrambling to deal with this problem as far as innovative equipment goes." Some companies, like Excel Industries, have equipment that automatically mulches the clippings.

In parts of the country, laws exist to outlaw people from collecting and then dumping grass clippings because of possible pesticide contamination.

"Mulching grass is not new," continues Munn.

Munn, originally an agri-

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SHORT CUTS

KEEPING IN TOUCH...Dick Bare, president of Arbor-Nomics, Inc., of Norcross, Ga., sends newsletters to all of his commercial and residential clients. "The Turfette" is for turf customers. "The Buggette" goes to tree and shrub customers. The letters are sent five times a year and contain topics such as lawn care, disease control and water conservation. "The newsletters have helped us build up the company," says Bare. "I try to write them like a friendly letter." Bare has learned the importance of image, and he wants to let his customer know that he's friendly, concerned, and easy to talk to.

HOUSING STEADY... The short term outlook for housing starts is pretty good, according to **Gopal Ahluwalia**, a Washington, D.C. housing analyst. Ahluwalia forecasts 1.39 million new homes to be built in 1989, down slightly from the 1988 figure of 1.49 million. Looking further ahead, he predicts 1.5 million new homes for 1990, and 1.6 million for both 1991 and 1992. Changing demographics will cause a slowdown in 1993. The ideal home size has also grown considerably. According to Ahluwalia, 1,200 sq. ft. was ideal 25 years ago. Today, homeowners want 1,800 to 2,000 sq. ft. Of course, paying for it is another story.

KEEP THEM SINGLE... Marriage can wreak havok with your employee health coverage. Speaking from his experience as an employer, **Tim Doppel**, president of Atwood Lawn Spray, Sterling Heights, Mich., says medical coverage for a single male costs $800 per year. But as soon as that worker ties the knot (and what self-respecting boss wouldn't include the wife in the health plan?) the cost soars to $3000.

ONE NAME, NEW OFFICE... Arizona-based Environmental Earthscapes/The Groundskeeper has grouped both companies under the name 'The Groundskeeper.' According to president **Jack Hasbrouck, Jr.** Recent "changes in the market demand for our services combined with increased regulation of our industry has caused us to re-evaluate our prior decision of maintaining separate divisional names." Hasbrouck said he was licensed to apply pesticides only under The Groundskeeper name, "and if I did a landscape construction under the Environmental Earthscapes name, I'd have to have The Groundskeeper subcontract to my own company." The Groundskeeper recently opened a new facility in Tucson.

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cultural dealer, took on turf equipment in the early 1980s. Turf sales to industrial/commercial users now make up 85 percent of his sales.

Munn: Grass clippings will be a problem.

"We took on the turfgrass industry for one reason. When the recession hit, we realized that the growth of grass is not affected by the cyclical nature of business. The only thing that affects its growth is Mother Nature," say Munn. □

LANDSCAPING

Developers going full service

LONG GROVE, Ill. — Landscaping will continue to have a high priority among leading developers and property managers, says Mark Hunner of The Brickman Group Ltd.

"With competition on the increase, developers understand that they must use every available resource, including high-quality professional landscaping, to develop their properties cost-effectively and to give them the competitive edge in attracting and keeping the best-qualified tenants or buyers," Hunner notes.

"Reflecting the growing use of full-service business consultants and suppliers, we foresee an increase in demand for full-service landscape management companies to creatively meet the landscape design, contracting and maintenance needs of developers and property managers."

The reason why? According to Hunner, whether a consequence of the last recession, the aftermath of 1987's stock market crash or the rise in mergers and acquisitions—companies have streamlined and no longer have in-house landscape staffs.

"And when one company is responsible for an entire project," concludes Hunner, "it often can build in efficiencies that reduce the total cost of services when contracted for separately." □

LITERATURE

Association data base now on line

WASHINGTON, D.C. — Barring any serious snags, American Association of Nurserymen members have, by April, access to a data base full of legislative information and the names of industry contacts.

Information in the data bank is based on member responses to surveys requesting the names of known state personnel currently involved in water availability and management, groundwater issues, and data on current or pending legislation in those areas.

"Some of the people will be affiliated with state governments, horticulture extension agencies or universities," says Brian Corsini, director of grower services for the association.

The data base is free to members as part of the Water Management Committee's work for the association.

Corsini said he is also working on putting the information into a computerized bulletin board format which allows other modem-equipped computer operators to call and access a specific menu containing congressional updates and other pertinent information. □

MANAGEMENT

Talk with the boss

ANAHEIM, Calif. — Your primary resources as a golf course superintendent are the people working for you, which is why it's essential that you let them speak openly with you.

"Almost without exception, each and every worker knows more about his or her job than we do," says Randolph P. Russell, manager of Parks and Recreation for the city of Austin, Texas. In order to get the most from them, says Russell, we need to listen, have an open attitude and explain our reasoning while caring for and trusting them.

Speaking at the 60th annual GCSAA conference here, Russell said that it's also important to accept failure. "Look at failures in a positive manner," Russell says, "Turn them into teaching tools."

The keys to success in dealing with your higher-ups, such as green committees, is to have a positive attitude, always offer a concrete plan or presentation, never confront them, but take on the role of a problem-solver, and never get upset in front of them.

"You control your relationship with your boss," says Russell. "You cannot rely on your job to speak for you. Create the ability to speak for yourself." □

GOLF

New GCSAA prez sets priorities

AURORA, Colo. — As the new president of the Golf Course Superintendents Association, Dennis Lyon plans to keep the GCSAA strong and successful, with concentration on the issues.

"GCSAA membership recently passed the 8,000 mark," says Lyon, "and we recently certified our 1,000th superintendent."

Lyon says the association's annual conference in Anaheim was a hit, with 150,000 square feet of space sold to exibitors, and an attendance figure of more than 15,000.

According to Lyon, who

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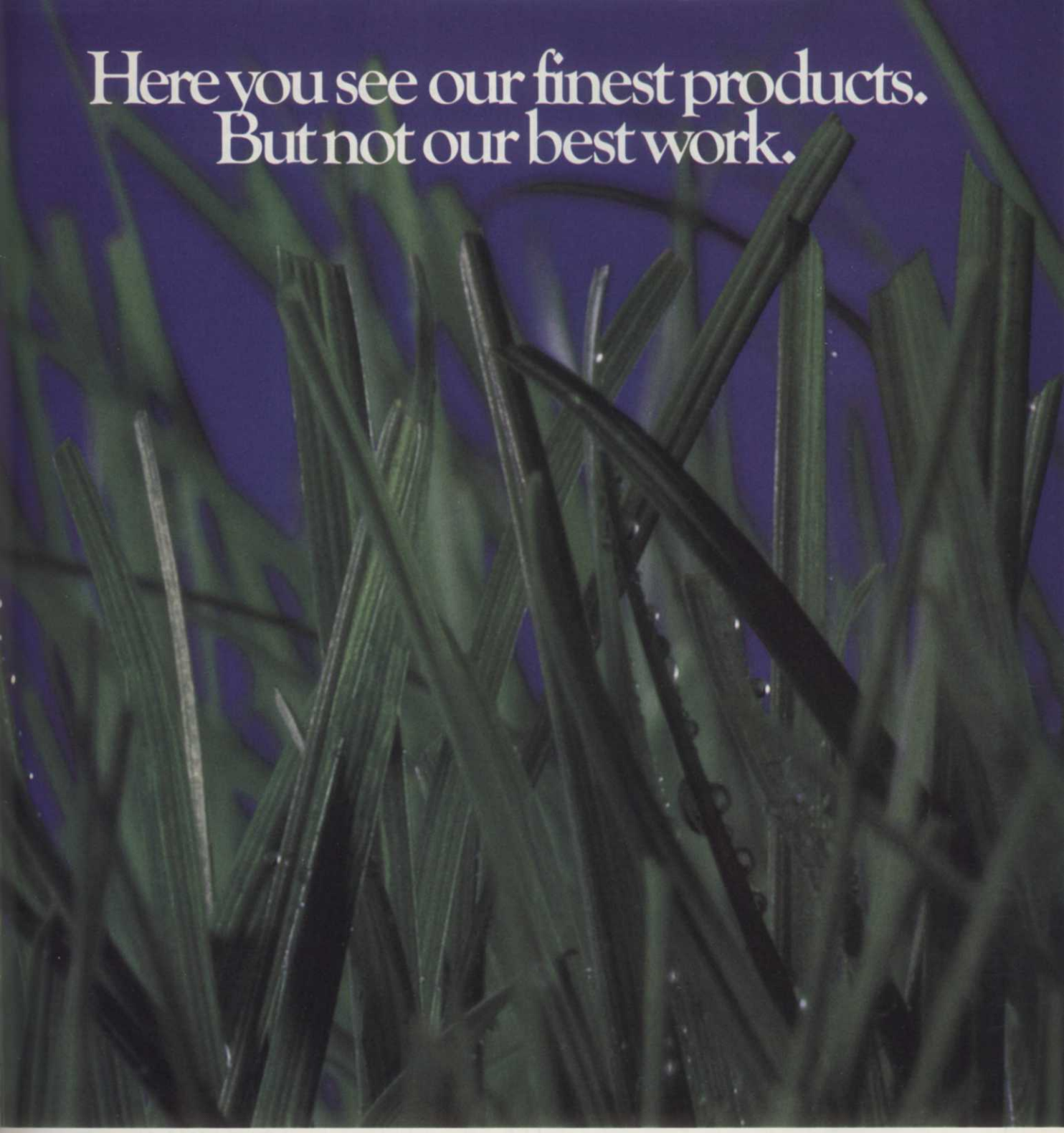

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is golf course super for the city of Aurora, Colo., the biggest issue facing the golf industry is "the environmental fate of pesticides." The GCSAA, says Lyon, is committed to funding research in that area. "We're taking the high road in dealing with the issues. We hope to work with legislators and the EPA to better help them make informed decisions." □

GOLF

Use soil tests for best care

ANAHEIM, Calif. — Soil test reports are gaining in stature as another step towards improved golf course maintenance, according to Tom Turner, Ph.D., University of Maryland.

The prime motivator in soil testing should be to prevent nutrient deficiencies in turf. Less frequently, the soil test is helpful in diagnosing degrees of toxicity.

Turner believes checks for nutrient imbalance will soon be more common. "Especially with these high sand content putting greens, the potential for micro-nutrient problems increases."

"One thing that you want to use soil tests for is monitoring your fertility program," says Turner. "If you've been in a deficiency situation, test periodically to see how quickly you can start correcting it."

Factors to consider in making phosphorus and potassium recommendations are soil level and soil condition. Sand and clay, for example, each have different nutrient requirements and compaction considerations. □

Chemicals

Preparation is best protection

DOVER, Ohio — A consulting and design engineer firm has been formed here to help the green industry develop safe and efficient systems for the storage, mixing and handling of chemicals.

Haskett/McCausland & Associates is designed to provide protection from spillage and leakage, significantly reduce or eliminate storage and disposal of chemical waste products, and increase speed and safety in loading and handling operations, as well as other chemical-related services.

The firm is at 425 W. Howe St., P.O. Box 337, Dover, Ohio 44622; (216) 364-1442. □

CONFERENCES

Warren meeting explores drought

AUSTIN, Texas — The continuing water shortage and its domino effects on the turfgrass industry was the main topic of the recent Warren Turf Kick-off Conference.

"The widespread drought of 1988 is merely hastening the focus on a challenge that we must face in this country," said Tom Bose of ABM Irrigation. "We have a finite amount of water in our country—we're not making any more—and we're using it, altering it, or transporting it to booming sunbelt population centers at unprecedented rates," said Bose, who predicted nationwide government regulation of water by the year 2000. □

SEED INDUSTRY

Jacklin expands into southwest

POST FALLS, Ida. — The Jacklin Seed Company has established a southwest office in Phoenix, Arizona and a research station in the Yuma and Imperial Valley areas.

Research at the Arizona facilities will be focused on warm-season grasses, particularly the improved and newly released Bermudagrasses and zoysiagrasses. Plans include doubling the Ari-

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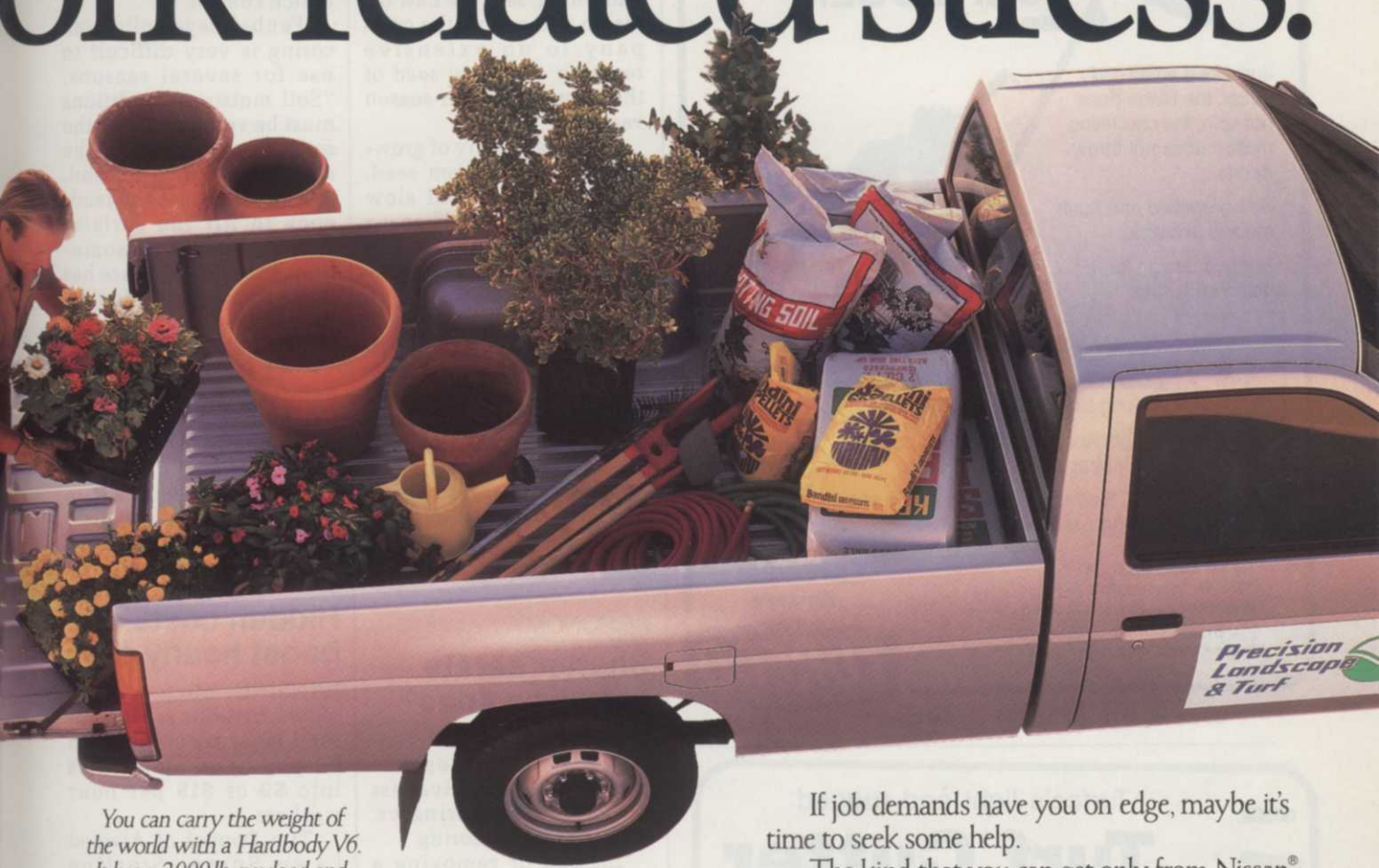

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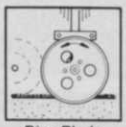
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zona acreage in 1989 and 1990.

Doyle Jacklin, director of marketing, said the new division will enable the company to do extensive research and grow seed of the improved warm-season varieties.

"Our capability of growing zoysiagrass from seed, rather than the old slow method using plugs or sprigging, broadens the market for zoysia markedly," Jacklin said.

The facilities will also enable the company to grow and develop its new Bermudagrass varieties which are more cold tolerant. "The new varieties will replace common types of Bermuda in areas which have previously experienced winter damage," said Jacklin. □

AGRONOMY

Shatter aerate or hollow tines?

The biggest aeration controversy involves the comparative effectiveness of hollow tine coring vs. solid, or shatter-coring.

Instead of removing a core of soil, the solid tine pushes it further down. The general concensus is that solid tine coring is not very effective, and might do more harm than good.

"Whenever you drive a solid tine into the ground, you're displacing a good deal of soil," says Doug Chapman of Dow Gardens, "and there may be a potential for damage, or further compaction. Basically, there's evidence that drier soil, or greens with high sand content, benefit most from shattering effects."

Robert Morris says a general feeling exists among supers that shatter-core aeration doesn't create enough disturbance within the turf to make it worthwhile.

Jerry Faubel, superintendent at Saginaw (Mich.) Country Club, prefers hollow tine coring.

"It benefits the soil in two ways: core removal helps the soil internally, and the cores left on the surface work well toward thatch control."

Faubel says solid tine coring is very difficult to use for several reasons. "Soil moisture conditions must be very specific. If the soil is too moist you lose the shattering effect. Second, the solid tine has the tendency to lift the surface. When you punch something in there, the space has to go somewhere. You either destroy air space or lift the soil.

"As far as greens are concerned," continues Faubel, "we might aerate occasionally. We're on a sand top dressing program, so we don't need to aerate the greens annually." □

BUSINESS

Hidden costs boost hourly pay

LANSING, Mich. — Employee benefits are the unseen labor costs that turn $6 per hour employees into $9 or $15 per hour workers.

Tim Doppel of Atwood Lawn Spray, Sterling Heights, Mich., points out that an employee might question a $6 per hour wage after writing out the bills and seeing the totals on the gross receipts. But Doppel reminds that there are many factors that make up what might be called a hidden labor rate.

T. Doppel

Beyond the base hourly rate, contributions to FICA—Social Security—can be about 7.5 percent per employee, matched by the employer.

In the insurance category, the biggest deduction is unemployment insurance. "Whether or not there are claims," said Doppel, employers pay state and federal unemployment tax; and depending on your experience ratio, you could pay as little as 2 percent, or up to 10 percent of the first

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Part of the "hit list." DURSBAN is particularly effective against billbugs, chinchbugs, sod webworms, cutworms and armyworms, among others. And because it bonds tightly to turf as soon as it dries, DURSBAN stays where it's applied. Won't wash away with rain or sprinkling.

Packaging options. DURSBAN turf insecticide is available as an emulsifiable concentrate in 2.5 gal. plastic jugs and 55 gal. drums. If you prefer a wettable powder, you can get the same efficacy in DURSBAN 50W, now offered in water soluble packets, pre-measured for the simplest, quickest mixing ever.

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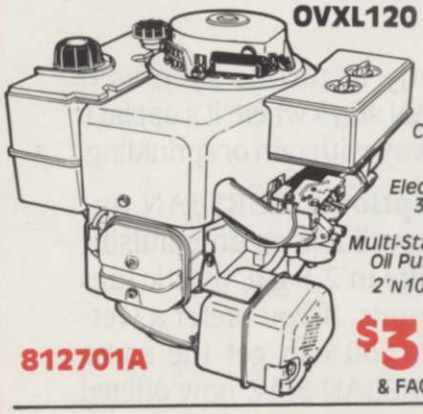

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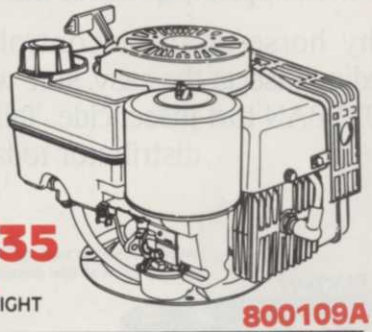

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LAWN CARE

LCOs growing for several reasons

NEW ORLEANS — Increased customer demand and a strong desire for greater profits were the main reasons lawn care operators (LCOs) expanded their services in 1988, according to a Dow Chemical Company survey.

Ninety-nine percent of LCOs polled said they now offer services beyond traditional lawn care, while 88 percent said they've seen an increase in customer demand for different services in the past year.

Additional services most frequently offered are tree/shrub fertilization and insect spraying (64 percent), mowing and lawn renovation (59 percent) and landscape planning (41 percent).

Forty percent of LCOs said their customer base turns over 5 to 10 percent a year, 28 percent reported a 15 to 20 percent loss and 25 percent said they lose 15 to 20 percent of their customers annually.

LCOs suggested various tactics that could reduce customer attrition, including better customer communication and education, better and more service, improved weed control and enhanced employee training.

The LCOs were polled at Dow's booth at the PLCAA meeting in New Orleans. □

PLCAA

$10,000 donated for NY court fight

MARIETTA, GA — The Professional Lawn Care Association of America has given $10,000 to the New York Pesticide Coalition war chest. The money is to help the Coalition in its ongoing court battle against New York state pesticide regulations.

"PLCAA is ready to challenge unreasonable regulation and legislation on a case-by-case basis and to put both dollars and people behind that fight," says PLCAA president, Robert F. Parmley.

PLCAA believes the New York lawsuit represents a significant step in the struggle for reasonable regulation of the use of pesticides, both for lawn care services and the entire green industry. A 1987 law enacted by New York state, plus further regulations enacted by the New York Department of Environmental Conservation, require customer contracts, prenotification and posting when pesticides are applied. PLCAA, the Coalition and other national trade associations feel the regulations and the law are unreasonable, overly broad and unjustified, given the pesticide safety data available.

PLCAA reports it has dedicated nearly a third of its 1989 operating budget to issues management, which covers legal activity, personnel, and a variety of public relations and coalition-building activities.

"Our mission is clear," said Parmley. "We have put a high priority on issues management." □

BUSINESS

Literacy center opens at Briggs

MILWAUKEE — Briggs & Stratton has been awarded a federal grant by the United States Department of Education for the purpose of promoting literacy in the workplace.

The grant will be implemented by a partnership comprised of Briggs & Stratton, Local 232 Allied Industrial Workers and the Milwaukee Area Technical College, says Gerald Zitzer, V P of Human Resources. □

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Frame design allows the 3325 to carry a full-size grass catcher on the center cutting unit.

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COVER STORY

TRIMMERS COME OF AGE

Almost all string trimmers are fast and efficient. You've got to look at small differences to find the one best suited to your work.

by Jay Holtzman, contributing editor

We're lucky to have string trimmers. They're fast, efficient and give us an alternative to expensive hand trimming and using potentially harmful herbicides.

Because they handily meet the needs of a broad variety of landscape professionals, in a relatively short time string trimmers have established themselves as one of the basic tools of landscape management.

But the string trimmer judged best for any application is largely a matter of the particular demands of the job at hand, personal preference and the vagaries of personal experience.

"All of them have drawbacks and advantages. You have to look at the kind of work you're doing and match the trimmer to the work," says Robert Mayer, landscape manager for Plant Care Co. of Dallas.

The first prototype nylon-line grass trimmer was invented in 1972 by George Ballas, a Houston entrepreneur, who named and trademarked his product "Weed Eater," according to Poulan/Weed Eater of Shreveport, La. Weed Eater remains a proprietary trademark of the company despite the widely-abused use of the name as a generic term for string trimmers in general. Weed Eater sells six million trimmers a year and 22 million overall. But today at least a dozen other companies also make and sell the trimmers to both homeowners and professionals.

Almost all landscapers interviewed said durability, safety and operator comfort are the most important elements to consider before buying a string trimmer.

Weeded out

With so many manufacturers of string trimmers, it can be hard to separate the essentials of good performance from sales promotion, and to choose a good value. But since many manufacturers jumped into the market with many fundamental design differences, the bad has been weeded out, leaving generally reliable designs.

"Trimmers have gotten better. They're lightweight and powerful enough," says Steve Wilster, president, Town and Country Landscaping, Inc. of Melbourne, Fla. "The manufacturers have ironed out their problems and many trimmers are very similar now."

Almost all the landscape managers we talked to cited a different brand of string trimmer as their preference. By the same token, none singled out any one brand for criticism. But many differences remain, and those small differences can make a big difference in performance over the long haul.

Virtually all the landscape professionals interviewed by LANDSCAPE MANAGEMENT mentioned the same three factors as being keys to what they expect and need from a string trimmer. They were: durability/dependability, safety, and operator comfort/ease of use. That the unit would have the power to perform well was assumed, which speaks well for the many choices available.

"Dependability is what we look for first," says Wilster. "We'd had trouble with other brands of trimmers over the last dozen years until about six years ago when we went with Echo exclusively. They seem to hold up really well. We can get a good season out of them before we have to rebuild the carburetor or do similar repairs, as long as the men service them correctly."

Operator comfort and the ease of use are important factors in safe use. The weight of the machine and whether or not the operator uses a harness or shoulder strap to support it all come into play.

"We primarily use the Echo 2500, which is lightweight enough that the guys don't get tired using it," says Wilster. They can hold it in their hands and not have to worry about having something slung over their shoulder to hold it up, yet it is powerful enough to get things done quickly and not bog down in heavy grass."

"When we use the 3000—which probably weighs 25 percent more than the 2500—the operators must use the strap, which is a little confining. They

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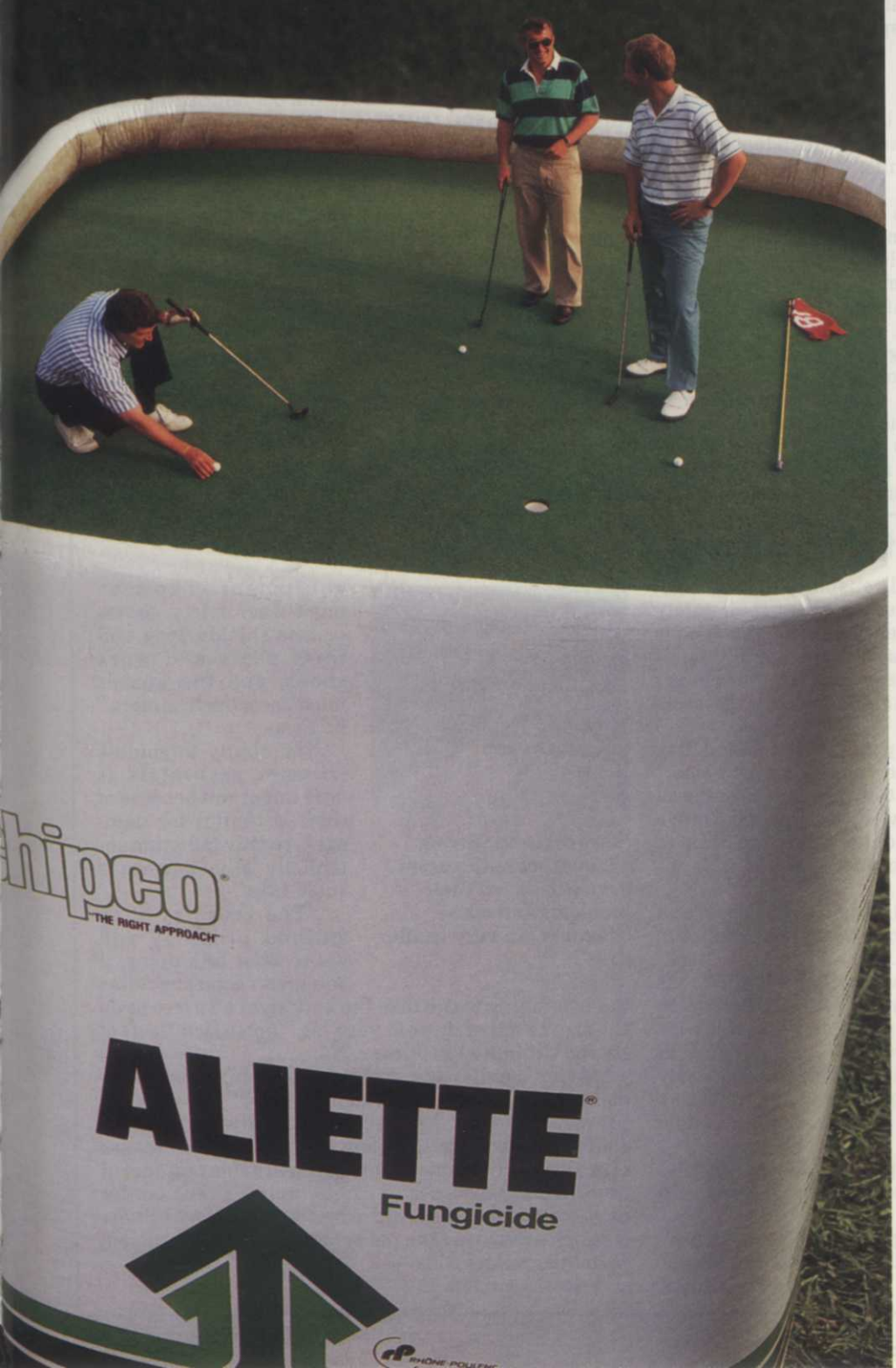

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use it, but it doesn't seem to be that functional," he adds.

Paul Woods, landscape operations manager for Garden of Memories, Myrtle Hill Cemetery in Tampa, Fla., has opted for Shindaiwa 35s.

"It's an important decision because of the volume of work we do with trimmers," notes Wilster. "We run a crew of five string trimmers. In our application it is one of the most important pieces of equipment we use."

He chose Shindaiwa trimmers for their performance, their ease of maintenance, and the availability of spare parts.

Strange bedfellows

"Mechanical reliability is the bedfellow of preventive maintenance. That is easily done on these units," Wilster says.

"When I came here four years ago, they had a hodge-podge of equipment. After experiencing some problems with power and with replacement parts, we came across Shindaiwa. They were reasonably priced, we were offered some good service agreements and we have been able to get the parts we need," he explains.

"With some other brands we had a problem obtaining the parts we needed to keep the equipment running longer—I'm speaking of small things like clutches and clutch springs," he adds.

Trimmers are doubly important to Woods because his operation relies on them almost exclusively for controlling growth in the cemetery and memorial park.

Woods has also been pleased with the optional aluminum "speed head" with which the trimmers have been equipped. "Working in a memorial park and monument cemetery, we were wearing out the plastic reservoir heads extremely fast. We were going through $5 worth of brass eyelets a day on the hole where the line feeds out," he says.

The speed heads don't hold a reservoir of line. Instead, line is cut into 10-inch lengths and laced something like shoelaces through a series of holes in the head, leaving several four-inch pieces as the cutting blades.

In addition, Woods' crews add a twist to working with their trimmers. "One thing we do to facilitate working around markers and monuments is to keep the handlebars in position and rotate the trimmer shaft and cutting unit about 40 degrees to the horizontal. This way the operator doesn't have to try to angle himself to put a nice edge around a monument. When we need to trim a broad area, it's a simple matter to rotate the shaft and head back to the horizontal," he explains.

Because of the heavy volume of trimming, all operators use shoulder harnesses with the trimmers.

"We use a double-shoulder harness, a true harness, not a shoulder strap. My men like it more than a shoulder strap because it centers the load and reduces the physical exertion and strain of having this load of about 12 pounds hanging from one shoulder for seven hours a day," Woods says.

Plant Care uses Echo and Green Machine trimmers. Mayer points out, as do several other landscape managers, that the harness or sling used with a trimmer can make a big difference to the operator using the machine.

"As much as I've tried to get my men to use the harness, they tend to fight it because they are picking up and putting down the trimmers so often during the day. The Echo harness is more trouble to get into than some others, so the crews tend to lose them or throw them away. The Green Machine, on the other hand, you can just put over your shoulder, and it has a padded strap, which I like. Either machine gives good performance, though," Mayer adds.

Another landscaper who has found important differences in the harness arrangements of different trimmers is Don

Emphasizing trimmer safety

In addition to the mechanical reliability of trimmers, landscape managers are concerned about their safety aspects. Most, if not all trimmers available today, have standard safety features such as a guard over the rotating line. But the action of the spinning line has danger potential that can only be countered by safe operating methods.

"A string trimmer will really pick up stones and fling them, and it will put some good velocity on them, too," says Steve Wilster, Town 'n' Country Landscaping of Melbourne, Fla. "It's best to wear long pants. You've always got to wear eye protection. And it is important to keep the guard on the machine, even if it is an inconvenience."

Proper use is also important, although the speed and versatility of a string trimmer can tempt the operator to use it improperly to save time.

Safe operation is also a high priority for Paul Woods of Garden of Memories/Myrtle Hill Cemetery in Tampa, Fla. "Operator safety goes hand-in-hand with operator comfort," Woods says. "I require my guys to operate string trimmers for six to seven hours a day when most landscape management companies may have only two or three guys that run them a couple hours a day."

He also requires trimmer operators to wear goggles and particle masks, uniforms with long pants and leather workboots.

Safety problems with string trimmers have been almost nil at Plant Care in Dallas, says Robert Mayer, because "we enforce safety regulations on all our equipment. The men must wear safety glasses or face shields, long uniform pants and work shoes, and the guards must be on the trimmers," he says.

Steve Wilster: **"String trimmer manufacturers have ironed out their problems and many trimmers are very similar now."**

The ability to guide a trimmer accurately is very important because of their potential for damage—swiftly inflicting potentially lethal damage to small trees.

"The user has to be trained properly and know what he's doing. If you aren't good at guiding the trimmer, you can take the bark right off a tree or do the same kind of thing to your leg," notes Don Davis of Lawns Unlimited in Sussex, N.J.

Mayer handles the problem by giving good safety and equipment education to his crews. "You've got to be very vigilant," he says. "You've always go to be concerned about the problem of girdling trees because of the amount of damage you can do in a short amount of time. We're very careful in our training program for new crew members. And when we familiarize them with trimmers we take pains to highlight this problem particularly," he adds.

—Jay Holtzman □

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Most trimmers available today have standard safety features such as a guard over the rotating line.

Davis, owner of Lawns Unlimited of Sussex, N.J. Davis says he always uses a harness strap with the trimmer because it eases the fatigue of use and makes the trimmer easier to guide accurately, but he doesn't like being tied to the machine.

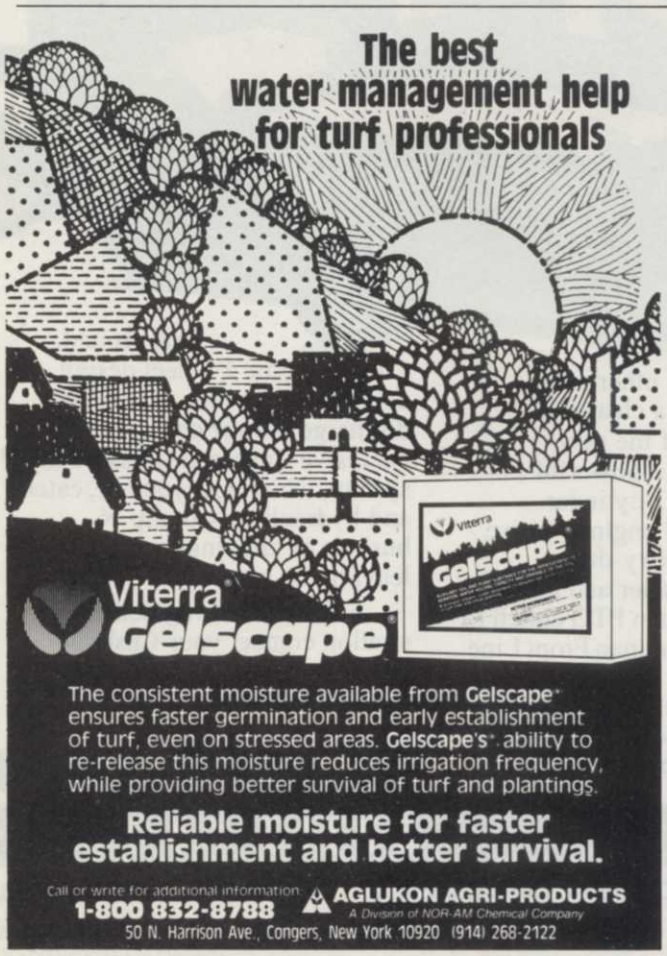
"I had a trimmer with bicycle-type handlebars that was easy to use, but you were strapped to it and you couldn't get out of it quickly if you had to, for instance, if you ran into a hornet's nest. I've got a Green Machine now. It has a quick release strap so that you can drop it and run if you have to," he says.

Tree damage

Woods also relies on operator instruction, mixed with some preventive measures. "Trees can be a very severe problem with trimmers. Most trees under two inches (in diameter)—Drake elms and camphor trees here have thin, easily-cut bark. With live oaks and Laurel oaks, the bark tends to be a little heavier and they can stand a little more abuse. But some of our trees have wounds as the result of mechanical injury from string trimmers that are healing over now," he says.

To prevent this, his crews now dish out an area around trees so they don't have to trim right up to the trunk. Woods also has considered using flexible black plastic drain hose, cut to 10 inches, split and placed around the trunks of small trees as a shield.

Although generally landscape managers are well pleased with the trimmers they use, there are differences in styles and types that any landscaper must take a close look at if he's to get the trimmer best suited to his needs. Purchase price is less important than value over the life of the machine. And a machine that is just that little bit easier to use can help prevent an injury or property damage that can be very costly in the long run. As in buying anything, let the buyer beware and remember that you get what you pay for. **LM**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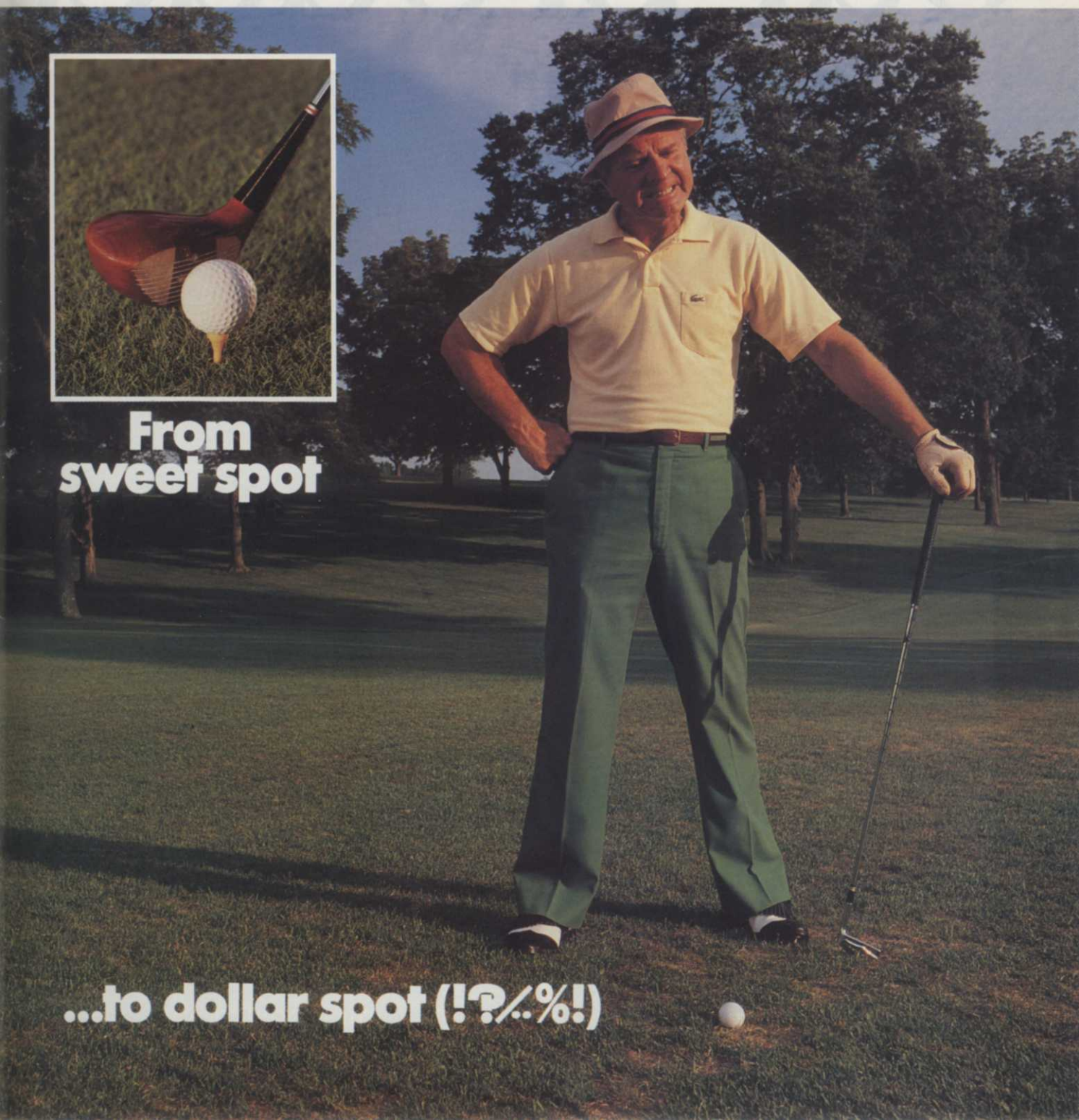

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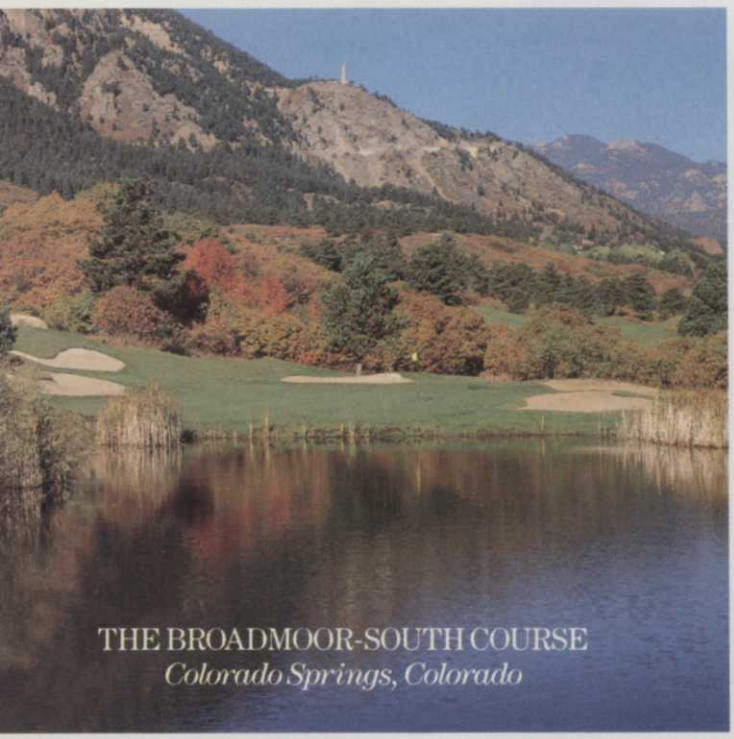

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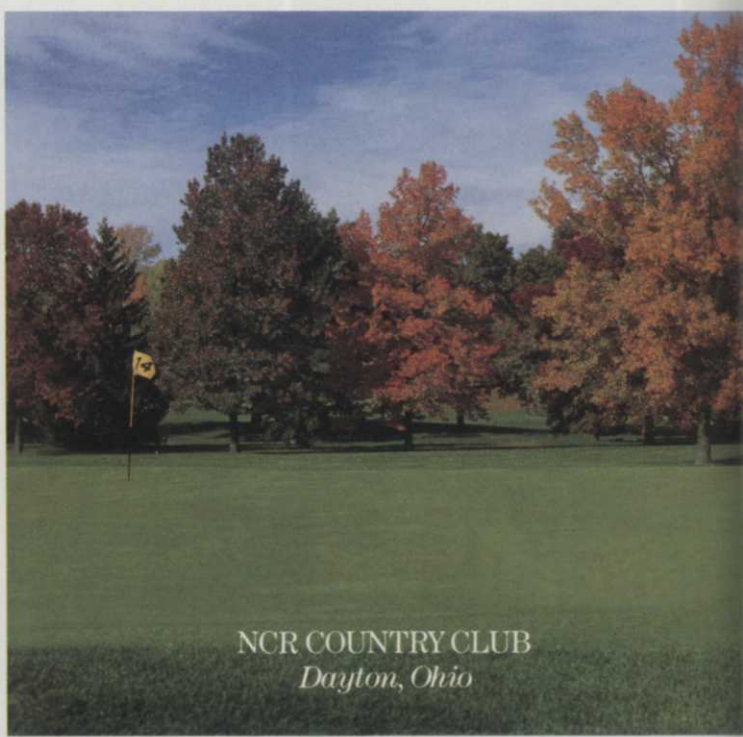

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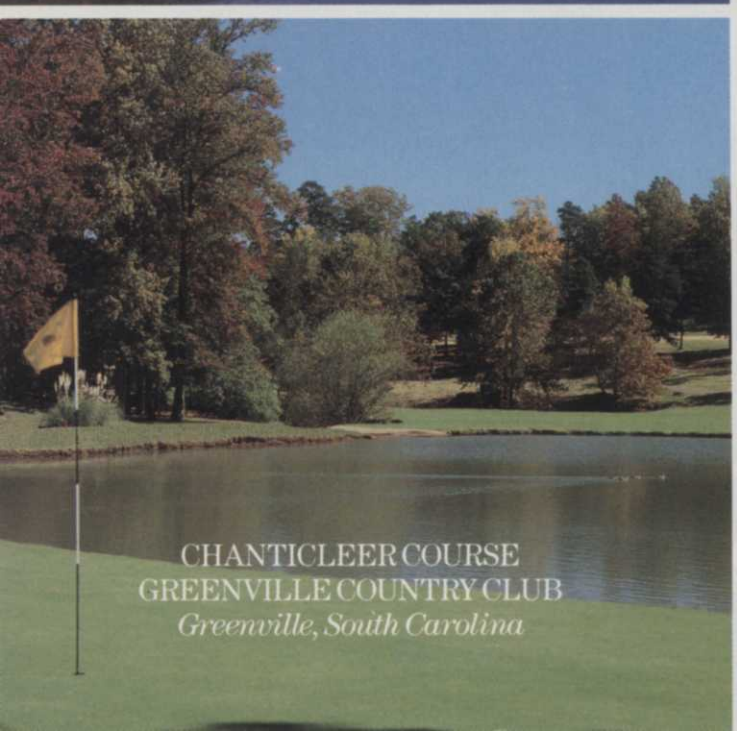

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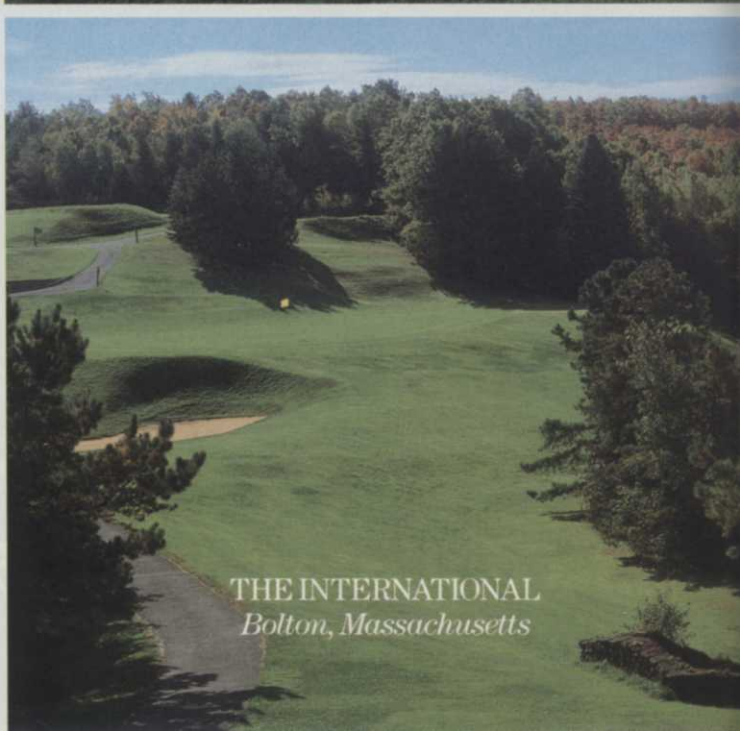

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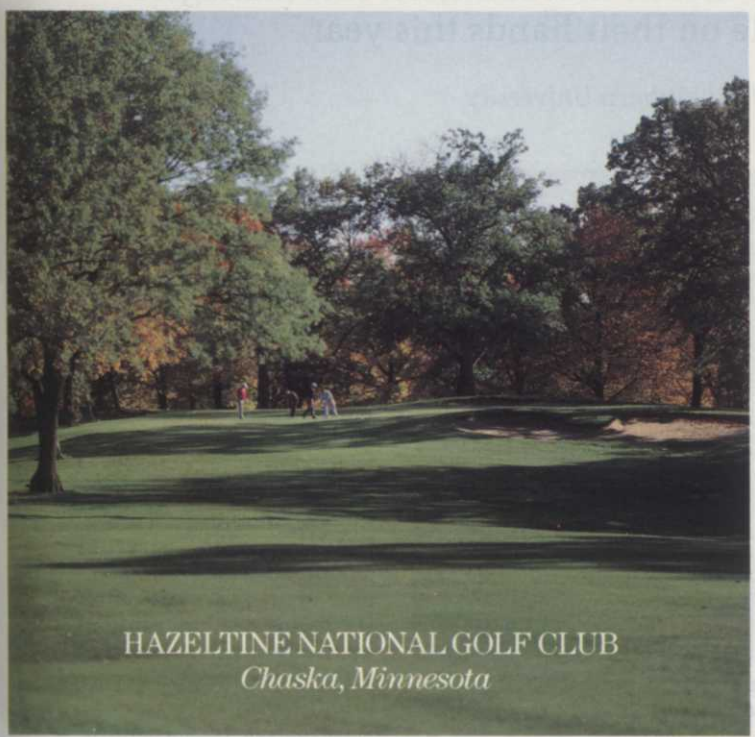

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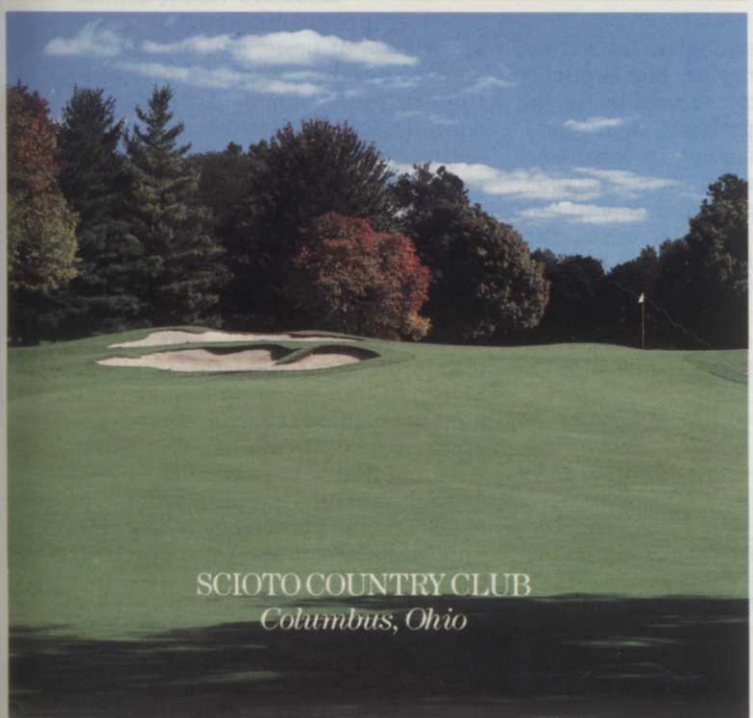

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WARM-SEASON INSECT CONTROL

The dry summer and mild winter means that southern turf managers can expect a fierce battle on their hands this year.

by Patricia Cobb, Ph.D., Auburn University

Insect control programs are an important part of the total system of growing grass for most southern turf managers. Drought, high temperatures and insect damage are three factors that have greatly influenced warm-season turf management the last three years.

Although we can only talk about the weather, insect control strategies must be reconsidered and updated annually. In the Southeast, "the big three"—mole crickets, grubs and fire ants—continue to require the most intensive and expensive control efforts.

Control of soil insects such as grubs, mole crickets and fire ants is often complicated by fall drought conditions.

Mole crickets

Mole crickets—now the South's most damaging turf insects—caused severe turf losses in 1988 as far west as Louisiana, and northward along the eastern coast of the Carolinas.

Mole crickets are annual pests in Florida, southern Georgia and the southern half of the mid-Gulf states. Most turf managers believe the drought conditions that existed during spring mole cricket flights resulted in higher infestations on irrigated turf. In addition, control strategies were complicated by the fact that mole crickets were two weeks late in hatching this past season.

Mole cricket control costs often range from $7,000 to $15,000 or more annually on golf courses. Monitoring populations in order to time controls properly is essential, and can reduce costs substantially. The loss of organochlorine residuals in the soil and an increase in irrigated, higher quality turf are often cited as reasons for the increase in grub problems each year.

While grub damage in warm-season turf has been more widespread, the severity of problems reported in most areas generally decreased during 1988. Dan Potter, Ph.D, at the University of Kentucky, reports that drought conditions in soil adversely affect grub hatching and development. (Perhaps there is one drought advantage, after all!)

Fire ants

Fire ants are a major "people problem" in the South.

Fire ant mounds are unsightly and make mowing difficult. But painful stings are the real problem. Several million dollars are spent in Alabama alone each year for fire ant control.

A hybrid form, found in northern Georgia, Alabama and Mississippi is reportedly more cold-tolerant than either of the two introduced parent fire ant forms. "Multi-queen" fire ant colonies are becoming common in many areas. Control strategies are complicated by drought conditions that drive fire ants down deeper into the soil.

Effective insect control programs are based on knowledge of pests, and of effective control options. While efforts continue in the development of biological controls, for most southern pests our options are properly timed and correctly applied insecticides.

This season, turf insecticides are still few in number. Some are currently under EPA review. A few are restricted to very precisely defined sites for use by permit only. New formulations of older products (Sevimol, a carbaryl formulation; Mocap 5G, an ethoprop formulation) have been introduced. Continued regulations of pesticide use will make wise and timely use essential.

High pressure liquid injection (up to 2000 psi) and gravity-flow, low volume granular applicators are parts of the new technology available for making more effective use of what we have available.

continued on page 40

Pat Cobb, Ph.D., has been at Auburn University for 12 years. She is a professor, extension entomology, Department of Entomology.

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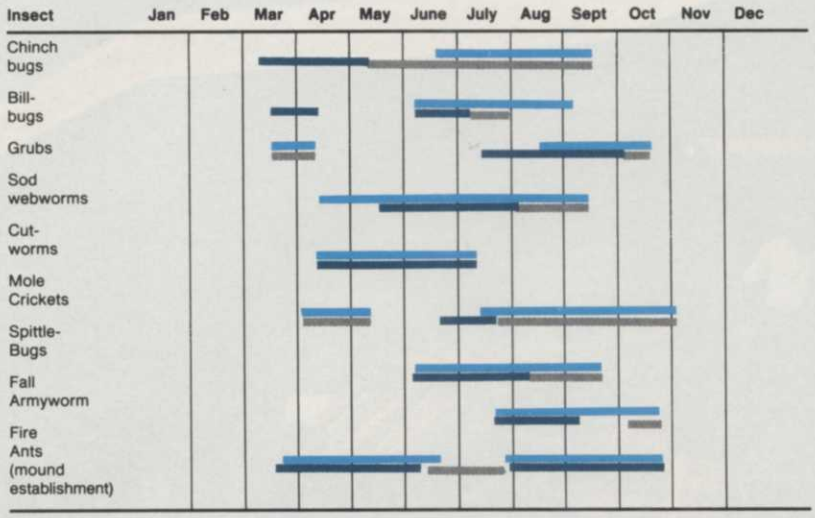
MONTHS WHEN INSECTICIDE TREATMENTS MAY BE RECOMMENDED
(▬▬▬ = 1ST CHOICE, ▬▬▬ = 2ND CHOICE)



*Timing of treatments varies from one area to another, and is considerably different in South Florida. Check with Extension Agents in your area and monitor pest populations to determine exact timing of controls.

Biological control products are, for the most part, still in the future. However, insect-infecting nematodes are for the first time being marketed for such lawn pests as grubs.

Research with "bio-engineered" insect bacterium-bearing endophytes (plants within plants) holds promise for making some warm-season grasses exempt from insect damage.

Back to basics

Adverse weather conditions that complicate and increase costs of strategies often remind us of the need to get "back to basics." There is no substitute for proper timing of cultural and insecticidal control efforts. Healthy grass sustains and recovers from damage quicker.

Monitoring pest populations and directing insecticidal controls at the vulnerable pest stage is more cost effective than "hit-and-miss" preventive treatments. The information contained herein is intended to assist the Southern turf manager with development of control strategies for common insect pests.

Late winter

Billbug and chinch bug adults may become active during warm days of late March in some years. Treatment if adults are numerous and active may prevent population build-up and turf damage later in the season.

Zoysia and Bermudagrasses are preferred by the hunting billbug. St. Augustinegrasses (except Floratam in most extreme southern areas) and occasionally Bermudagrasses are infested by chinch bugs.

Early season treatments should be done during midday when billbug and chinch bug adults are most active. Re-infestation later in the season may occur from infested, untreated adjacent turf areas.

Grubs become active in more southerly areas in late March. Evidence of "varmint" digging—armadillos, skunks, raccoons—may indicate movement of grubs into the root zone of the turf.

Generally, treatment at this time is "second best" behind middle to late summer applications for smaller grubs. However, late March treatments may be necessary in areas where grubs are detected for the first time, especially in cool-season grasses in order to reduce damage before the turf enters summer dormancy.

Warm-season grasses, in many instances, will recover from early season grub damage. In the south, the period between spring grub activity and pupation is short. (The pupa is the stage from which the beetle emerges that is not affected by insecticides). Therefore, if spring treatment is done it is most effective during late March or early April.

Areas receiving spring grub treatment should be checked in middle to late summer for small grubs since reinfestation may occur. Mole crickets are the most damaging turf insect pests in the southeastern U.S. Timing of controls may vary from one area to another. Therefore, monitoring populations is critical since proper timing is often as important as insecticide choice.

In southern Florida mole crickets are active year around. Mole crickets may be active during winter months anytime a few consecutive days of warm weather occur. In mild winters—such as the last three—tunneling damage may continue periodically from November into late winter months. However, tunneling usually increases dramatically during late March in most areas.

Mole crickets begin mating flights in late March, so in most areas March treatment is not recommended. Turf should be maintained properly throughout this time however, in order to minimize tunneling damage.

Spring (April-May)

Chinch bug and billbug adults become more active during the warmer days of spring. Generally, egg laying occurs in April on warm-season turf. April treatments may prevent population build-up by eliminating egg-layers and, therefore, reduce damage later in the season.

Chinch bug treatments in May reduce the first nymphal (immature) population. Grubs that have not pupated can be controlled during early April. Infested areas that don't "green up" should be checked to verify the presence and stage of development of grubs.

Irrigation or rainfall should follow grub applications. In some areas of the South, Japanese beetle grubs are a problem on lawns. Spring is a good time to make applications of milky spore disease products for these grubs. However, other grub species are not controlled by these products.

Mole crickets remain active during April and early May. Spring treatments may be needed in severely damaged areas if overwintered crickets are present. To determine cricket presence, pour soapy water (2 tbs. liquid dishwashing soap in 1 gal. water) on turf areas where infestation is suspected. Crickets will usually surface in three to 15 minutes (longer in cool weather).

Irrigate soap-flushed areas afterwards to avoid sun-scald damage to the grass. Egg laying takes place during April and May. Nymphs usually hatch in central Florida during April and May. Farther north, hatching begins in late May or early June. Sod webworm larvae that have overwintered in the turf begin feeding when

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Overwintered spittlebug eggs hatch in the spring. Noticeable damage usually appears in June and July and may continue during the summer and fall.

the grass greens up in spring. These larvae soon pupate, and moth flights are common in April. Larvae usually hatch about two weeks after the moth flight peaks.

Sod webworm damage to the turf may resemble disease injury. Areas frequented by birds (such as starlings) can be flushed with soapy water to verify the presence of sod webworms.

Cutworm moths begin egg laying in the spring. The larvae hatch, and feed at night on grass blades. Damage is most often a problem on golf greens. Moths prefer to lay eggs in aerification holes, so larval feeding may be mostly associated with the turf around these holes.

Feeding damage is usually a spring problem (April-May), but some years is observed throughout the summer. Insecticides for cutworm control should be applied late in the afternoon so that contact will be made with the night-feeding larvae. Little, if any, irrigation after treatment is advised, unless specified by the product label.

Fire ants continue to be a "people problem" throughout the South. These ants inflict painful stings to man and animals. Quarantine and regulatory measures require treatment and inspecting sod and nursery stock that is shipped out of the fire ant zone.

Fire ants begin to establish new mounds during warm, wet spring days. During this time these ants are near the soil surface and workers are actively foraging for food. Fire ant baits often work well during this time, and broadcast treatments may eliminate new mounds that are not yet visible above the turf surface.

Old, established colonies can be mound-treated with a contact insecticide about two weeks after baits are broadcast. Most baits work slowly. Delaying treatment of established mounds gives the ants a chance to find the bait and feed it to the queen(s), but eliminates workers that might otherwise be present for several weeks.

Summer (June-August)

Chinch bug damage usually first appears during dry periods of June. Damage may continue into fall since there are several overlapping generations. St. Augustinegrass varieties (except Floratam in most extreme southern areas) are most commonly attacked, but as in the past dry summers, Bermudagrasses may occasionally be damaged.

Treatments may have to be repeated if re-infestation from untreated borders or lawns occurs. Billbug grubs can be found in the soil by middle to late June. Check areas of turf, especially zoysias and Bermudagrasses, where adult billbugs were observed in the spring.

Persistent drought stress symptoms on irrigated turf, or "thin" sod may indicate a billbug problem. Treatments should be applied like other grub treatments: watered immediately after application.

Grub problems are becoming more widespread in southern turf. Late summer treatments are usually the most effective for controlling grubs.

Beetle flights most often peak sometime in June, and "new generation" grubs are usually present by middle to late August. However, during drought years such as the last three seasons, grub emergence patterns, egg laying and survival may be affected.

Check turf where spring grub activity occurred, or where bird feeding is observed, before treatment is done. If the weather is hot and dry, irrigate the day before treatment to move grubs into the root zone. Remember to also irrigate after treatment.

Green June beetle grubs may move over the turf surface (on their backs with legs up). These are large grubs that cause mostly mechanical injury. Because of their mobility they can move from untreated, unmanaged areas onto turf.

Mole crickets hatch during late spring and early summer. By late June and early July, newly-hatched nymphs of both species are present. In most areas of the South, mole crickets hatched almost two weeks late in 1988.

Because of the voracious feeding by the tawny mole cricket (and the short-winged mole cricket in south Florida), there is the potential for sudden, serious turf loss as nymphs increase in size during July and August. Timing of controls for mole crickets varies with location.

Monitoring hatching and weekly presence of newly hatched nymphs by soap flushing is suggested as an aid to developing a seasonal control program.

Residual controls, such as Mocap 5G and Oftanol, are most effective on younger nymphs. Treatments should be watered immediately. Triumph 4EC has provided several weeks residual control. Current registrations within southern states (Special Local Needs, 24(c), registrations) specify sites for Triumph's expanded use. Less residual mole cricket treatments include bait applications and/or sprays with Orthene 75S. Baits are most effective in the mid-Gulf states from July through September. Orthene sprays seem to be more effective on two- to three-week-old nymphs than on newly-hatched mole crickets. Orthene sprays and/or bait treatments should be applied late in the day to turf irrigated several hours earlier, and not irrigated (or as label specifies) after treatment.

Sod webworms damage warm-season turf most severely from late June through August. Insecticide applications should be made when larvae are present or a week or two after peak moth flights from infested turf. Two-lined spittlebugs are primarily lawn pests. However, other turf areas have been damaged in recent years. Since spittlebugs are highly dependent upon moisture for survival any area with thick turf, thatch accumulation and high humidity is susceptible to

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INSECTICIDE DIRECTORY

USE SUMMARY OF SOME COMMON TURF INSECTICIDES*

Common Name	Trade Name	Major Uses	Primary Use Site ***
acephate	Orthene 75S	fire ants mole crickets	A, G, L, S
**bendiocarb	Turcam	grubs mole crickets	A, L
carbaryl	Sevin SL Sevimol	billbug (adults) cutworms fall armyworms green June beetle grubs grubs sod webworms	A, G, L, S
chlorpyrifos	Dursban	billbug (adults) chinch bugs cutworms fall armyworms fire ants sod webworms spittlebugs	A, G, L, S
diazinon	Diazinon	billbugs chinch bugs fall armyworms fire ants grubs sod webworms spittlebugs	L
**ethoprop	Mocap 5G	grubs mole crickets	A, G, L, S
isofenphos	Oftanol	fire ants grubs mole crickets	A, G, L, S
**isazofos	Triumph	chinch bugs mole crickets grubs	L (G&S in some states)
trichlorfon	Dylox, Proxol	cutworms fall armyworms grubs sod webworms	A, G, L, S

*Fire ant baits (Affirm, Amdro, Logic, Pro-Drone) are not included above, but may be used in non-crop areas)
**Restricted Use
***A=athletic turf L=lawns G=golf courses S=sod farms

damage.

Adult spittlebugs are pests of ornamentals, but the piercing-sucking feeding of nymphs (immatures) damages turf. Adults are especially attracted to Japanese hollies, and move from these shrubs to surrounding turf.

Overwintered eggs, laid in the turf, hatch in the spring. Noticeable damage usually appears in June and July and may continue during the summer and fall due to at least two overlapping generations.

A variety of warm-season grasses may be infested. Damage first appears as yellow spots, then these areas spread and eventually die. Masses of "spittle" enclosing nymphs located deep within the turf may give the turf a "squishy" feeling when walked on. Infested areas should be mowed (remove clippings) and watered before treatment. Thatch management and prevention of excessive watering may disrupt the humid environment necessary for spittlebug survival.

Spittlebugs are usually not a widespread problem during drought years except on thick turf with irrigation.

Fall armyworm moths arrive in the spring from southerly areas such as Central and South America. Along the Gulf Coast, fall armyworm damage to turf is usually reported by late June. Bermudagrasses that are highly maintained are preferred. Although several generations may occur each year, damage to turf is usually not permanent unless disease, drought or other stress follows.

Damage to turf from fall armyworm feeding during summer can be "repaired" by proper fertilization and watering. Although fall armyworms may feed in large numbers anytime during the day, they are often most active in early morning and late afternoon. Treatments are most effective at these times.

Ground pearls are scale insects that live up to 10 inches deep in the soil. They are found in areas along the Gulf Coast, sandy soils of the central Gulf states, southern east coast areas and parts of the Midwest.

These pests damage turf most severely during summer when other factors such as heat stress, disease and drought weaken the grass. Centipedegrass is especially susceptible to damage when over-fertilized. Eggs hatch within the soil in the spring, and nymphs feed throughout the summer by piercing root tissue and extracting plant fluid.

Chemical control of ground pearls has not been effective. Rather, proper fertilization, disease control and adequate irrigation have been effective in controlling damage.

Fall (Sept.-Oct.)

Fall may be the most difficult time of the season to control southern turf insect pests. Attacks on turf by surface feeders, such as fall armyworms and sod webworms, may result in damage that is difficult to repair on warm-season grasses before winter dormancy. Thatch-dwellers such as chinch bugs and spittlebugs can be controlled during fall; but again, stress to the turf may be greater entering dormancy because of damage by uncontrolled populations.

Control of soil insects such as grubs, mole crickets and fire ants is often complicated by fall drought conditions. Irrigating turf before treatment as well as after treatment may be necessary to realize effective control of these pests.

Grubs and mole crickets are more effectively controlled at smaller, more immature stages earlier in the season. Grub treatments are usually most effective during August and September. Treatments become less effective as the soil temperature decreases and grubs move deeper into the soil to overwinter.

Mole crickets fly again in the fall, and damage is more severe as turf growth slows. As the temperature decreases, insecticides work more slowly. Fall mole cricket treatments of Orthene 75S are more effective in August and September than in October. As for residual treatments, Triumph 4E has provided effective fall mole cricket control (for use by professional lawn care only; or restricted in designated areas).

Fire ants that have become established during the season are difficult to control during hot, dry fall periods. Once rain begins, new mounds are established and area broadcast treatments, as well as mound treatments, may be necessary in heavily-infested areas. **LM**

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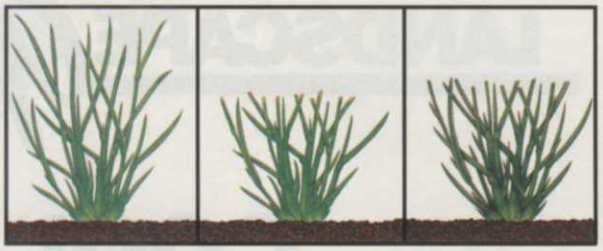

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COOL-SEASON INSECT CONTROL

The good news is that the drought last summer reduced grub populations. The bad news is that chinch bugs will pick up the slack.

by Harry D. Niemczyk, Ph.D., Ohio Agricultural Research & Development Center

What impact will the Midwest's drought of 1988 have on turfgrass insects in 1989? Well, it should come as no surprise that there is both good and bad news.

The good news is that grub populations in many areas are reduced. The drought delayed emergence of adult beetles that often had to lay eggs in dry soil. Because these eggs need to absorb soil moisture soon after being laid, many eggs did not survive. Eggs that did hatch produced larvae that had a tough time surviving in dry soil.

Though the population of egg-laying adults was reduced in 1988, irrigated turfgrass areas often had grub infestations that were near "normal."

Chinch bugs are pests that are at their peak under hot, droughty conditions, which is why they thrived last summer. The fact that the turfgrass turned brown and went into dormancy poses no problem for these pests. Though dormant, the plant is still very much alive so chinch bugs can probe plant stems, crowns and roots with their piercing, sucking mouthparts and obtain all the plant fluids necessary to keep them alive and well.

The bad news

The real damage is caused by them simultaneously feeding and injecting salivary fluids into the plant. The presence of this foreign substance reduces the plant's capability to circulate water and nutrients, and can ultimately lead to its death. Turfgrasses under moisture stress are particularly susceptible.

Billbugs lay their eggs in early April and May. Therefore, when turfgrasses became dormant in 1988, the larvae were well established and had no problem finding living crowns, roots and rhizomes to feed on.

Unlike the chinch bug, which can frequently be seen darting around the turfgrass surface on adjacent paved areas in July and August, billbug larvae feed beneath the soil surface, hidden from view. Damage from both these pests is most severe in turfgrass areas under moisture stress, where damaged turf looks no different than

Is it drought, insect injury or both? Damage from chinch bugs (left), like billbug damage, is frequently masked by the similar symptoms associated with moisture stress (right).

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the dormant turf and is therefore frequently undetected. It often becomes apparent only after the turf receives rain or irrigation yet fails to recover.

Look for an abundance of chinch bugs and billbugs this year.

Despite the influence of the 1988 drought, near "normal" infestations of grubs can be expected in 1989, especially if "normal" amounts of precipitation occur.

Life cycle is key

Knowing the life cycle of pests is still at least as important as selecting an insecticide for their control. This guide points out some of the seasonal occurrence of some important cool-season pests to be on the lookout for this year. Best control will come when you apply insecticides during the pest's most vulnerable stages, which are outlined here. No endorsement of products is intended, nor is criticism implied for those not mentioned.

Late winter

Chinch bugs and billbugs—In northern zones chinch bugs and billbugs both overwinter as adults in thatch or sheltered sites near buildings. Summer drought has led to high overwintering populations.

They can become active during warm days in March. Infestations of hairy chinch bugs and bluegrass billbugs also occur in zoysia, Kentucky bluegrass and fine fescues.

Grubs—The larvae of this group of pests normally overwinter six inches or deeper in the soil. If spring comes early, grub activity can be expected along with skunks and raccoons, which tear up the turf in search of them. Moles, which feed on grubs and earthworms, also become active at this time.

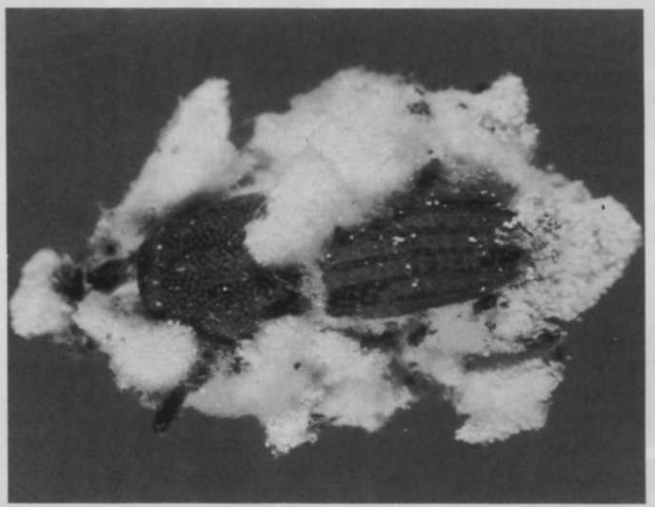
Black turfgrass ataenius—This golf course pest overwinters as an adult in the soil under debris in roughs or other protected areas. A few may be seen flying about on warm afternoons in early March. Usually this activity begins when crocus starts blooming and intensifies as the bloom of red bud appears.

Greenbug—The only stage of the greenbug known to overwinter in northern states is the egg. Shiny black eggs deposited the previous fall may be found adhering to grass blades, fallen tree leaves or other debris.

Sod webworms—The most common sod webworm species overwinter as larvae in the thatch or upper inch of soil. Feeding does not resume until hibernation (dipause) is broken by early spring warmth.

Spring

Chinch bugs and billbugs—As warm days of spring approach, movement of chinch bug and adult billbugs increases rapidly. Generally, egg laying begins the first week of May, but can begin in mid-April if spring arrives early. Occasionally adult billbugs can be seen on sidewalks on warm afternoons.



A bluegrass billbug infected with the parasitic fungus (*Beauveria spp.*).

Generally, application of insecticides to prevent infestations of chinch bugs and billbugs should be completed by the first week in May. Applications may begin as early as the last week of March. Such applications must be made before significant numbers of eggs are laid. This time may vary as much as a week or more, depending on spring weather.

Grubs—Overwintered grubs return to the surface and begin feeding on turfgrass roots in April. Increased activity and damage from birds, moles, skunks and raccoons foraging on grubs can also be expected. Feeding by birds, mammals and grubs continue through May.

Treatment should de delayed until the grubs are in the top one inch of soil. Irrigation or rainfall should follow such applications to aid in moving the insecticides to the target grub as soon as possible.

Although milky disease products for control of Japanese beetle grubs may be applied any time there is no frost in the soil, spring is a good time for such applications. The soil is open and frequent rains move the disease spores into the soil and thatch.

Milky disease products are primarily effective against Japanese beetle larvae. Ineffectivity against other species is low.

Incidents of large grub infestations (larvae of June bugs, for example) have been increasing in cool-season areas. Locations of such infestations should be identified because reinfestation is likely every three years.

Eggs are laid in May and June, therefore treatment should be made in late summer, early fall of that year or the next spring while the larvae are small. Later applications against full-grown larvae have given inadequate control in past studies.

Black turfgrass ataenius—Adults of the black turfgrass ataenius can be seen "at wing" in April and are often found in clipping catchers after early mowing of golf course greens. These adults begin laying eggs in early May, or about the time *Vanhoutte spirea* first comes into bloom. Dursban applied to a fairway at this time kills adults and prevents summer infestation of larvae. Check with local extension entomologists for the precise time if needed.

A second application, two weeks after the first, may be needed to successfully prevent infestation.

Sod webworms—Overwintered larvae of the sod webworm begin feeding as soon as the grass begins to grow. Usually damage is insignificant, but areas that do not green up may be infested. These areas frequently have probe holes from starlings feeding on larvae.

Moth flights begin in May in northern areas. Young larvae are usually present about two weeks after the spring moth flight peaks, so treatment of young larvae can be done in May in some areas.

Cutworms—Moths of cutworms begin laying eggs on golf course greens and other turf areas in the spring. These eggs hatch, producing larvae that feed on grass blades during the night. The black cutworm is the most common species on cool-season turf.

While visible damage is uncommon on home lawns, damage can be significant on golf course greens in late May.

Greenbug—Greenbug eggs begin hatching as early as April, but significant infestations do not develop until later in the year. Greenbugs are also brought into the region from the south

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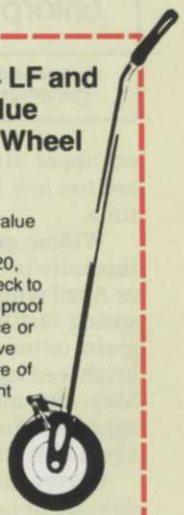

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Circle No. 154 on Reader Inquiry Card

SUMMARY OF GRUB CONTROL TESTS IN OHIO - 1971-81[1]

INSECTICIDE	LB AI/A	MEAN % CONTROL	(NO. OF TESTS)[2]
ethoprop (Mocap)	5.0	83	(10)
isazofos (Triumph)	2.0	92	(20)
bendiocarb (Turcam)	2.0	83	(18)
isofenphos (Oftanol)	2.0	80	(37)
carbaryl (Sevin)	8.0	64	(14)
trichlorfon (Proxol)	8.0	81	(23)
diazinon	5.5	60	(16)
chlorpyrifos (Dursban)	4.0	43	(11)

1 Includes Japanese beetle, Cyclocephala spp., Phyllophaga spp. only. 2 Each test replicated 3 or 4x. Generally, treatments applied late summer or early spring. Irrigated (¼-½ inch) after application, thatch - ½ inch, readings taken ca. 4-8 weeks after treatment.-H.D. Niemczyk & K.T. Power.

on upper air winds. Aphid numbers are too low to detect in lawns at this time.

Winter grain mite—Damage from this mite is often first noted in March or April when turf areas are receiving spring fertilizer applications. Winter grain mites are identifiable by eight bright red legs and a dark body. By late May, the mites will have laid their eggs and died. Mites do not appear again until the eggs hatch in October.

Clover mites—Incidents of visible damage to home lawns are often seen in April in several Ohio cities and Denver. Usually a nuisance pest in and around homes, the clover mite occurs in large numbers (5,000 per square foot) across entire lawns and on turf next to building foundations. Symptoms of injury were the same as the winter grain mite. Turf next to foundations may be killed.

The clover mite has a slightly pink body and eight pale-colored legs. The first pair of legs is extremely long and protrude well out in front of the mite. The absence of bright red legs distinguishes the clover mite from the winter grain mite.

Summer (June-August)

Chinch bugs—Chinch bug eggs continue to hatch into June. Bright red nymphs with a center white band appear. The number of chinch bugs increases rapidly in June. Their populations peak in July and August, when northern lawns can receive severe damage. This damage is often masked by summer dormancy of turf caused by drought. Hot, dry conditions are ideal for chinch bugs.

During August the nymphs molt into adults that mate and lay eggs, thus producing a second generation. Some northern areas have only one generation per year.

Billbugs—Bluegrass billbug larvae feed in grass stems during June and move to the plant crowns, roots and rhizomes during July. This feeding pattern causes brown spots that frequently resemble the symptoms of some fungus diseases. Symptoms are also often masked when the turf is dormant from drought.

The larvae usually move deeper into the soil under dry soil conditions. During late July and August the larvae burrow deeper into the soil to pupate and transform into adults.

Grubs—By June, grubs have stopped feeding and are in the pupal stage, three to four inches in the soil. Beginning in mid-June and continuing through mid-July, the adults of various species emerge and burrow into the soil to lay eggs. Hatching and appearance of young larvae occur during July and August.

Extreme heat and drought during the summer may cause some grubs to move deeper in the soil. Under such conditions, irrigation several hours before treatment and a thorough soaking afterward is adviseable.

Black turfgrass ataenius—Eggs laid by beetles during May hatch in June and the larvae immediately begin feeding on turf roots and thatch.

From late June to mid-July, symptoms of injury include wilting in spite of irrigation. In July, larvae move deep into the soil, pupate and emerge as adults. These adults lay eggs during August, producing a second generation in some states. The second generation larvae are capable of damaging turf. States farther north have only one generation.

Sod webworms—Damage from sod webworm larvae occurs occasionally in most of the cool-season turf region. Injury is more common in midwestern states, usually in July and August. Older sod fields or areas with heavy thatch are good candidates for infestation. There are generally one or two generations per year, depending on the species.

Cutworms—Cutworm larvae continue to cause damage to golf course greens from June through August. These larvae pupate in the soil or thatch and emerge as moths that lay eggs for additional generations.

Fall armyworm—The fall ar-

Chart p. 54, Article p. 56

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Circle No. 233 on Reader Inquiry Card

INSECT CONTROL

COOL SEASON*	LATE WINTER	SPRING (April-May)	SUMMER (June-Aug.)	FALL (Sept.-Oct.)
CHINCH BUGS	When summer damage is expected preventative application of liquid or granular Dursban (1 lb. Ai/acre) Triumph[1] (1 lb. Ai/acre) or Oftanol (2 lbs. Ai/acre) may be used as soon as the insects become active.	Preventative applications of insecticides should be completed by the first week in May.	Treat before injury is severe with Dursban (1 lb. Ai/acre), diazinon** (2.5-5.5 lbs. Ai/acre), or other labeled insecticides.	Treat if necessary, but generally infestation levels are not high enough to warrant using insecticides.
BILLBUGS	Same as for chinch bugs.	Same as for chinch bugs	Treat infestations at same rates as grubs with Triumph[1] diazinon**, Turcam, Proxol or Sevin. Irrigate following application.	Treatment is usually not appropriate at this time.
GRUBS	Application of Oftanol (2 lbs. Ai/acre) during March may provide control of overwintered grubs. This may not provide control into late summer.	A single application of Oftanol (2 lb. Ai/acre) made in April may control overwintered grubs. Can also be controlled in May by spot or general treatment with Triumph[1] (2 lb. Ai/acre) Turcam (4 lb. Ai/acre) or Sevin (8 lb. Ai/acre). Golf course superintendents can use Mocap (5 lb. Ai/acre) or Sevin (6-8 lb. Ai/acre) to control green June beetle. Irrigate with application.	Existing infestations found in July or Aug. may be treated with Triumph[1], Proxol, Turcam, Oftanol, Sevin or Mocap (commercial turf only) at rates used in spring. Treat green June beetle with Sevin (6-8 lbs. Ai/acre).	Treatment can be made as late as Mid-September. Irrigate first if thatch or soil is dry.
SOD WEBWORMS	Treatment is not appropriate at this time.	When necessary, apply diazinon** (5 lb. Ai/acre) Triumph[1] (1 lb. Ai/acre) Dylox or Proxol (6-8 lb. Ai/acre). Orthene (1-3 lb Ai/acre).	Make application when larvae are present or two weeks after peak moth flight. Use Dursban (1 lb. Ai/acre), Triumph[1] (1 lb. Ai/acre), Dizainon** (5 lbs. Ai/acre), Sevin (6-8 lbs. Ai/acre) or Proxol (6-8 lbs. Ai/acre).	Larvae are small and cause little damage at this time. Treatment in September reduces population for next spring.
GREENBUGS	Treatment is not appropriate at this time.	Aphid numbers are too low to detect.	Use Orthene (l lb. Ai/acre) or Dursban (1 lb. Ai/acre) or diazinon** (2.5 lbs. Ai/acre).	Severe infestations may occur as late as December. Use the same insectides as in the summer.
BLACK TURFGRASS ATAENIUS	An application of Oftanol (2 lb. Ai/acre) in March may prevent summer infestations of larvae, but it's best to wait until April.	Application of Oftanol (2 lbs. Ai/acre) during April or May can prevent larval infestations during summer. Dursban (1-2 lbs. Ai/acre) applied to fairways in April also prevents infestations. Retreatment after 2 weeks may be necessary.	If preventative applications were not made, spot or generally treat with Triumph[1] (2 lbs. Ai/acre), Proxol (8 lbs. Ai/acre), Turcam (2-4 lbs. Ai/acre), Sevin (8 lbs. Ai/acre) or Mocap (5 lbs. Ai/acre), as needed.	Undeveloped larvae die with frost.
CUTWORMS	Treatment is not appropriate at this time.	The insecticides effective against sod webworm are also effective against cutworms. Apply late in the afternoon. Do not irrigate following liquid applications unless specified on label.	Use Orthene (1-3 lb. Ai/acre), Dursban (1 lb. Ai/acre), Triumph[1] (1 lb. Ai/acre), Proxol (8 lbs. Ai/acre) or Sevin (6-8 lbs. Ai/acre). Do not irrigate following liquid applications unless specified on label.	Same as for summer.
CLOVER MITES	Treatment is not appropriate at this time.	Liquid diazinon** (2.5 lbs. Ai/acre) or Dursban (1 lb. Ai/acre) may be used.	Treatment usually is not necessary.	Treat as needed with liquid diazinon** (2.5 lbs. Ai/acre) or Dursban (1 lb. Ai/acre).
WINTER GRAIN MITE	If needed, use spring treatment.	If treatment is necessary, use liquid diazinon** (2-3 lbs. Ai/acre) or Dursban (1 lb. Ai/acre). Avoid repeated use of Sevin.	Treatment is not appropriate, since mite is in egg stage.	Treatment is not appropriate since mite is in egg stage.

[1] For use only by commercial lawn pest control personnel except in states where Special Local Needs labeling permits use on golf course tees, greens and aprons, and on sod farms. A maximum of one application per year is permitted for the 2 lbs. Ai/acre rate. A maximum of two applications per year at least 60 days apart is permitted for the 1 lb. Ai/acre rate.

* See accompanying text for details; always follow label directions.

** Diazinon may not be used on golf courses or sod farms.

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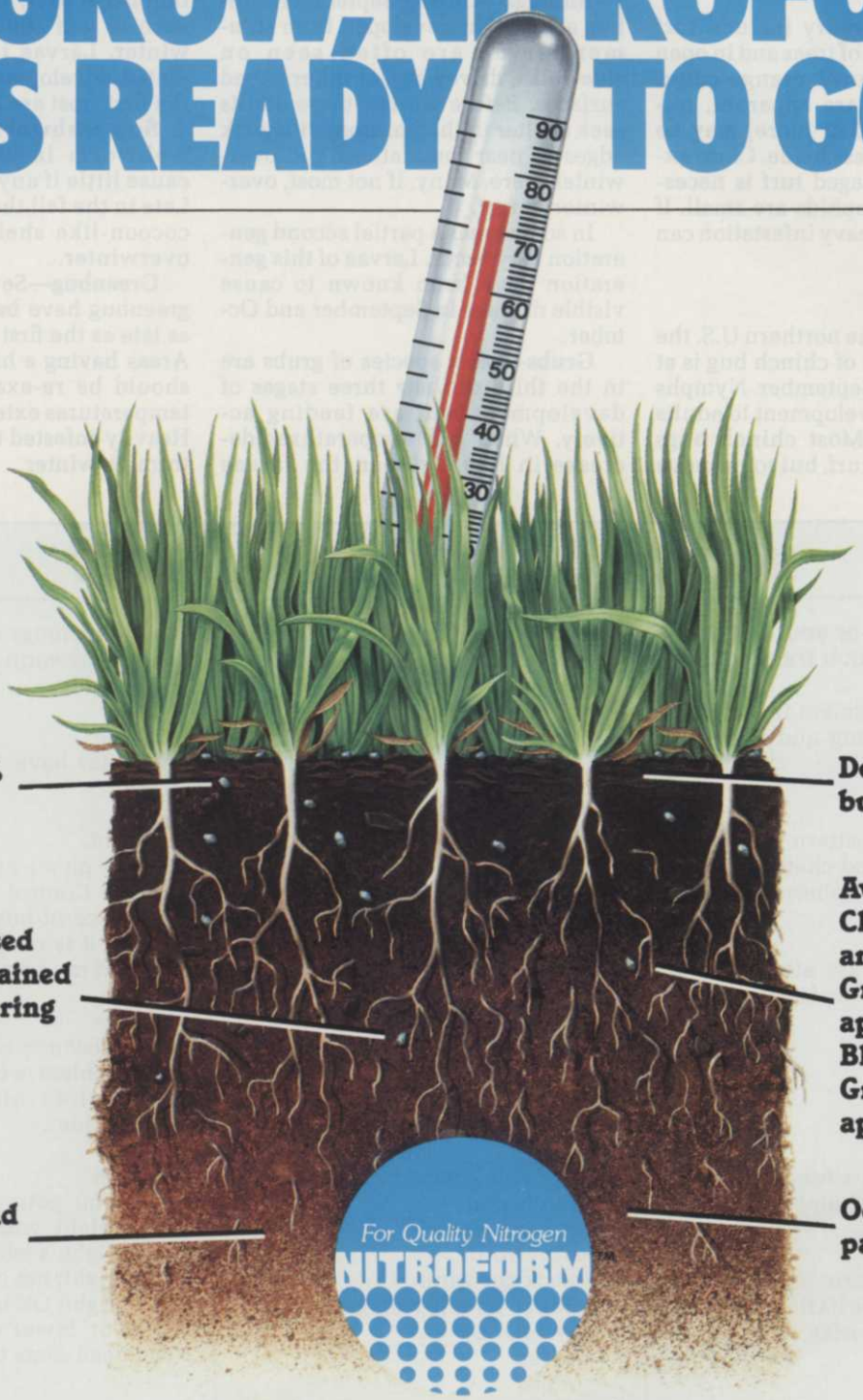

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Circle No. 151 on Reader Inquiry Card

INSECTS *from page 54*

myworm is seldom a problem of cool-season turf.

Greenbug—Damaging populations of greenbugs can occur from June through August. Populations and incidents of damage frequently vary from area to area, even within the same city.

Symptoms of injury include turf under the dripline of trees and in open areas having a burnt orange color. When symptoms are apparent, numerous aphids (40 or more) may be seen on a single grass blade. Close examination of damaged turf is necessary because the aphids are small. If left untreated, a heavy infestation can kill the turf.

Fall (Sept.-Oct.)

Chinch bugs—In the northern U.S. the second generation of chinch bug is at peak numbers in September. Nymphs complete their development to adults in late October. Most chinch bugs overwinter in the turf, but some move to protected areas before winter.

Generally, infestation levels at this time are not high enough to warrant the use of insecticides. Early fall rains and infection by a parasitic fungus (*Beauveria spp.*) usually provide sufficient control.

Billbugs—During September, billbug adults that developed from summer larvae are often seen on sidewalks, driveways, or other paved surfaces. Before winter, these adults seek shelter in thatch, along sidewalk edges or near foundations and overwinter there. Many, if not most, overwinter in turf.

In some areas a partial second generation may occur. Larvae of this generation have been known to cause visible damage in September and October.

Grubs—Most species of grubs are in the third of their three stages of development and are feeding actively. When soil temperatures decrease in late October, the larvae burrow deeper into the soil to overwinter. If soil temperatures remain warm, larvae stay at the surface and continue feeding. Severely cold winters have little effect on survival.

Black turfgrass ataenius—By September, adults of the current generation begin to fly into protected areas, such as golf course roughs, to overwinter. Larvae that have not completed development to adults before the first frost are killed.

Sod webworm—Northern sod webworm larvae are small and cause little if any damage in the fall. Late in the fall the larvae construct a cocoon-like shelter in which they overwinter.

Greenbug—Severe infestations of greenbug have been known to occur as late as the first week of December. Areas having a history of infestation should be re-examined when mild temperatures extend late into the fall. Heavily-infested turf will not survive through winter. **LM**

INSECT EXPERT OR NOVICE?

Quiz yourself or your crew to see how much training is needed.

1. Droughty, dormant turf often masks chinchbug and billbug damage.
   - true
   - false

2. The rastral pattern of the northern masked chafer is two parallel rows of spines.
   - true
   - false

3. Black turfgrass ataenius lay most of their eggs in _____.
   - April
   - May
   - June
   - July
   - August

4. *Beauveria* is a fungus that infects and kills chinchbugs.
   - true
   - false

5. The northern masked chafer completes its life cycle in _____ year(s).
   - one
   - two
   - three

6. Chinchbugs have _____ mouthparts.
   - chewing
   - piercing-sucking
   - rasping

7. Grubs consume _____.
   - turf roots only
   - thatch
   - soil
   - soil, turf roots and thatch

8. Bluegrass billbug adults lay eggs in _____.
   - soil
   - thatch
   - grass crowns
   - grass stems

9. Greenbugs feed on tree leaves.
   - true
   - false

10. _____ is a common pest of golf greens in the cool-season region.
   - sod webworm
   - armyworm
   - black cutworm

11. Most species of grubs overwinter as _____.
   - larvae
   - pupae
   - adults
   - eggs

12. Chinchbugs can be controlled by spring application of insecticide.
   - true
   - false

13. Mites have _____ legs.
   - four
   - six
   - eight

14. The phone number of the Poison Control Center nearest my place of business is posted where it is readily available to me and my employees.
   - true
   - false

15. Resistance is usually not the problem when poor insect control is obtained with insecticide.
   - true
   - false

If you got:
15 right you're super
14 right: a job well done
13 right: not bad
12 right: OK but...
11 or fewer correct means you need some training!

1.True. 2.False. 3.May. 4.True. 5.One. 6.Piercing-sucking 7.Soil, turf roots and thatch. 8.Grass stems. 9.False. 10.Black cutworm. 11.Larvae. 12.True. 13.Eight. 14.True (I hope). 15.True.

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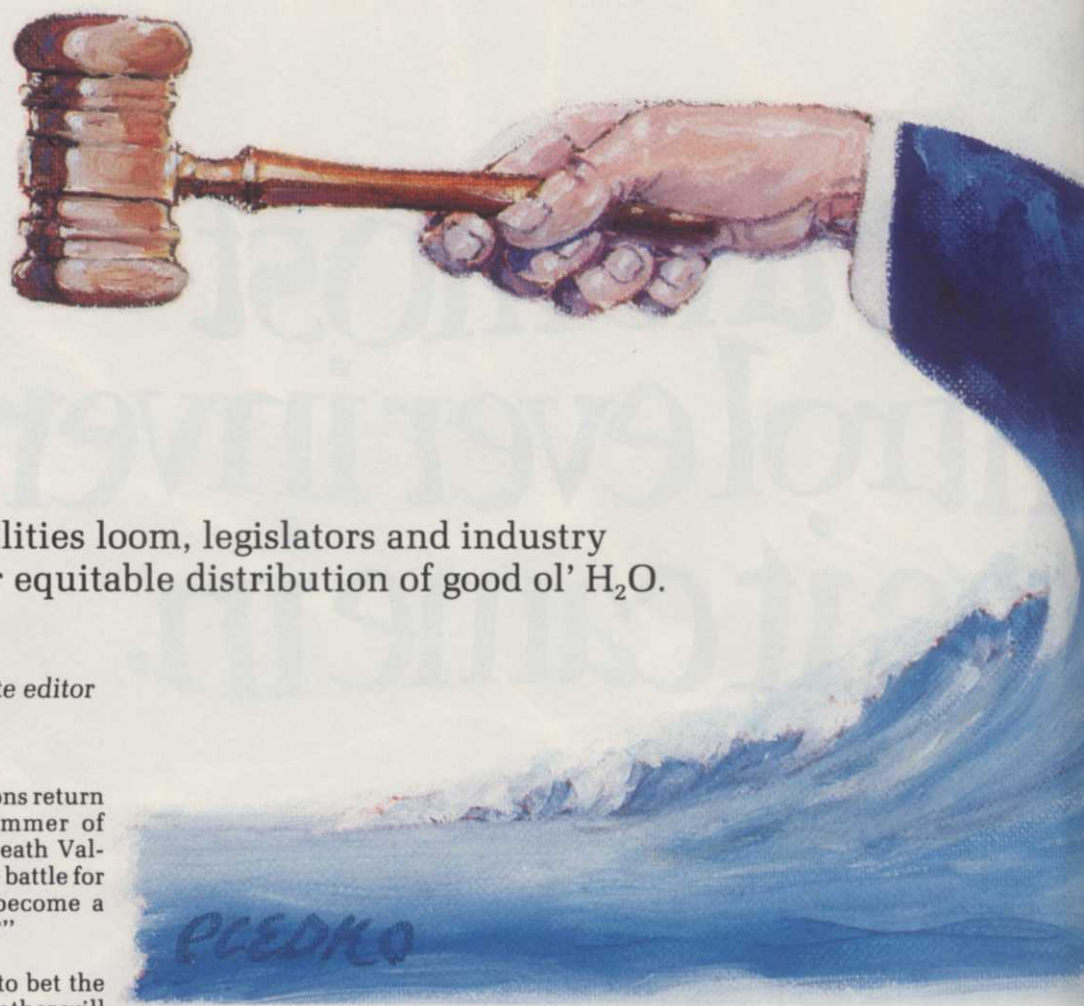
Circle No. 108 on Reader Inquiry Card

THE POLITICS OF WATER



As drought possibilities loom, legislators and industry associations vie for equitable distribution of good ol' H_2O.

By Terry McIver, associate editor

Will drought conditions return and make the summer of 1989 a rerun of "Death Valley Days?" And if so, will the battle for control of city reservoirs become a "Gunfight at the OK Corral?"

Maybe and maybe.

No expert is yet willing to bet the ranch that this summer's weather will match the drought conditions of 1988, which parched the Corn Belt, reducing soybean and grain production. But no one can deny that Mother Nature just hasn't been herself lately.

Warmer-than-usual temperatures prevailed this winter, with January temperatures reaching the 60s in many Midwestern cities. Played behind this scenario is the ongoing drama of water legislation and regulation. Every day of lower-than-normal rain or snowfall increases the possibility that communities everywhere will again be subject to strict rationing of local water supplies.

Enter the green industry

As a major water user, the green industry plays a large role in water politics. Unfortunately, due to its high visibility, it's often miscast as a water-wasting heavy—the black-caped villain who uses water to no end. Clarifying that image has been the task of industry associations in touch with local legislators. What are they finding? At the bottom of the legislative well is the bottled message: participation in local legislation and education is crucial to making laws more fair and favorable to the green industry.

Randy Tischer, president of Green Velvet Sod Farms of Bellbrook, Ohio, believes the summer of 1988 was an example of "what may happen unless we (the sod industry) become better informed and have an impact on those who make the decisions."

Fred L. McGee, Jr., executive director of the Florida Irrigation Society, fights the fly-by-nighters and promotes the use of efficient irrigation systems.

Tischer says that by August of 1988, with drought horror stories being reported nationwide, "some well-intentioned but ill-informed decisions were made.

"When household water taps went dry in Illinois," says Tischer, "the agricultural irrigators were identified as the cause of the misery. When city planners and those issuing building permits in Indiana and New Jersey announced their new regulations concerning landscaping and the use of water, in many cases they simply eliminated the plan's irrigation system/turfgrass allotment."

Preparing for the worst

An ongoing situation in

Participation in local legislation and education is crucial to making laws more fair to the green industry. The message: that reputable firms do not waste water.

California illustrates the action industry must take to get its share of water. To support the cause for an equitable water policy, William Pogue, president of Irrometer Co. of Riverside, Calif., and past president of the Irrigation Association, helped form the Water Conservation Development Committee prior to the drought of 1988.

When the drought hit and pending legislation loomed, Pogue says the Irrigation Association bemoaned the fate the irrigation industry faced: less water and more legislation. Still, Pogue and the association pressed ahead with plans to educate those who might "inadvertently ruin our market."

The message: reputable lawn care and irrigation companies do not waste water; the real culprits are poor irrigation systems and mismanagement of those systems.

Members of IA's water conservation development committee have met several times with state assemblyman Steve Clute concerning proposed legislation—specifically, Assembly Bill 325. This bill would have required every local agency, city or county to adopt a "xeriscape ordinance" by January 1, 1991 for all new developments. The bill called for limits on turf in the landscape, prohibitions on median strip planting requirements for warm-season grasses and requirements for use of water-efficient plants.

William Pogue, president of Irrometer Company, believes the best defense against unfair water policy is a coalition of green industry professionals.

...Overruled!

Although the Irrigation Association's comments were "well received," according to Pogue, the bill was introduced without taking into account any of its suggestions.

Assemblyman Clute says the state department of water resources would coordinate cooperation between local governments, thereby eliminating conflicting legislation. "We've added language to the bill requiring adjacent local governments to cooperate in drafting ordinances," says Clute.

Clute says mandatory water meters were part of the plan, but many homeowners are reluctant to install them.

In regards to plant selection, Clute

says lawn care professionals would be asked for input regarding plant selection and other technical requirements, such as irrigation and drainage systems.

Efficient systems conserve

Bill Le Blanc, eastern region general manager for Hardie Irrigation of Florida, says state regulations affect water use, drainage, and more recently the recycling of effluent water. In certain sections of the state, more effluent is being returned by packaging plants to home irrigation systems.

Le Blanc believes xeriscaping—considered by some to be an "anti-turf" movement—is an opportunity for the turf people to install more drought-tolerant grasses, and for irrigation people to install proper systems.

The best defense is to form a green industry coalition of all irrigators.

"Just as we got used to driving smaller cars," predicts Le Blanc, "we will find ourselves wanting to live with more economically designed and managed irrigation systems."

Executive director of the Florida Irrigation Society, Fred McGee, agrees that lousy irrigation systems make for lousy water conservation, "and we want to help out the water management district by putting in proper irrigation systems that don't waste or pollute water."

According to McGee, the society is lobbying for more regulation of the irrigation industry, to put the squeeze on fly-by-night installers who buy a business license for $15, throw some PVC pipe in the trunk and call themselves irrigators.

"There is no such professional regulation at this time. And with 75 percent of Florida's water being used for irrigation purposes, much is wasted.

continued on page 64

Can xeriscape and turf proponents co-exist?

In these times of drought and water bans, the term "xeriscape" is heard more and more. Cities and counties are even passing "xeriscape legislation," so called because of xeriscape's minimum turf and water requirements.

Proponents of turfgrass, most notably the American Sod Producers Association (ASPA), recently challenged the South Florida Water Management District on its use of the words "limited turf areas," when drafting its xeriscape code.

After discussion with the ASPA, the district changed the code to read "practical turf areas."

"Generally I agree with the concept of reducing water waste," says ASPA president Ed Davis. "What I disagree strongly with is their (the Water District) attacks on turf as being the cause of water waste. The water that's wasted is wasted by people, not by the turf."

Davis is concerned over what he believes will happen in the long run if turf areas are drastically reduced.

"Turf is one of the best, if not *the* best, groundwater filters available. If we get a negative attitude towards turf, we're going to get an imbalance. The evapotranspiration and other benefits of turf have been proven."

Tom Teets, senior water use engineer and xeriscape project manager for the South Florida Water District, was surprised at ASPA's objection.

"In Texas, which has a huge sod industry, there's never been a problem with xeriscaping," relates Teets. "They've accepted that turf does require more irrigation."

The controversy goes back to southern Florida's preparations for a model landscape code, which was named the Xeriscape Code.

"What the contractors had done," recounts Bruce Adams, assistant director of land and water planning and national president of the Xeriscape Council, "was put together an advisory committee to hammer out a concensus document which would act as a model landscape code. It was then submitted and accepted by the district. That consensus document had representatives from every major affected industry, including the turfgrass people.

"We concluded that we were aiming at placing turfgrass in both the design and function of a landscape, in the most 'practical' areas of landscape. And if we reduce turfgrass to any extent, it would be to that extent in which we did away with the hard-to-manage, hard-to-irrigate parts of the landscape."

Adams insists that both groups are working toward the same goal. "Our backing of the turfgrass association is to make sure that we, the industry and the public support them in improving the grades of turfgrass that are produced—in looking at the new drought-resistant varieties that we and the industry are researching and promoting with our funding."

ASPA executive director Doug Fender denies any adversarial relationship between turf and xeriscape. "I'm sure if you were to talk to xeriscape proponents, they would not describe their desired result as rocks, bushes and stumps, but as something which would allow for vegetation," assures Fender. "The extreme element would have nothing growing. Somewhere in between there's ground for us to talk and work together to achieve practical solutions for the environment."

Fender believes the relationship between the "turfites" and xeriscapers could be improved by more communication. Letters between leaders of all groups and attendance at one another's meetings are two ways to better relate.

"I think to some extent there's a feeling that enemy camps are forming," says Fender. "And, as with any problem, it's from a lack of information."

With the techniques and plant material now available, there is a huge opportunity to save large amounts of water and still maintain quality projects, believes Tom Ash, director of the Water Conservation Demonstration Garden in Riverside, California. "It's more a question of changing the homeowner's attitude," he says. "The first aspect is limiting the size of lawns. Provide a lawn area for exactly what you need. I advise people to think about their lawn's size and use water-efficient varieties like tall fescues, perhaps Bermudagrasses or zoysias that are being introduced into the industry, not eliminating lawns.

"I think the xeriscape fanatics who are into cactus and rocks are the extreme. They're not going to attract many people and are probably going to hurt the intentions of the mainstream xeriscapers."

—*Terry McIver* □

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J-23-8

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WATER *from page 62*

This also contributes to shortages and water sprinkling bans."

As part of its role in the legislation game, the Florida Irrigation Association has developed its own guidelines for turf and landscape irrigation. A joint effort by the water management districts, the University of Florida Agricultural Engineering Department and irrigation professionals statewide, the plan is offered to other counties as a model.

Atlanta's water woes have received much press coverage by the city's local papers as evidenced by a recent headline: "After Dry January, Summer Water Restrictions Loom for Metro Area."

Atlanta not so peachy

County Commissioner Lillian Webb says all local governments will have to keep water conservation measures in place. Water officials "don't want to pick on any one company," says Webb. "We try to work with landscapers, encouraging them to do more work in the fall and winter, and to use more rocks and pebbles, and less plants."

Tim Thoms, marketing director for Select Trees, Fayetteville, believes the legislative process is complicated by the levels of bureaucracy, with everyone shifting the blame onto someone else's shoulders. "First," Thoms recites, "you have the Atlanta Regional Commission, an advising and planning body made up of local governments and municipalities. They communicate with each municipality and county and try to reach agreements. And the county and metro agencies each have their own water bureaus."

Dick Bare, president of Arbor-Nomics in Norcross, Ga., questions why some industries are overlooked when it comes to water use restrictions.

"Chicken processors, using about a million gallons per week, weren't legislated at all to speak of, and yet we're picked upon because we're in a more visible industry," Bare notes. Sprinkling bans are off-target, he says, because the commercial systems run on cycles which aren't always in sync with the midnight-to-morning water window.

Too many fly-by-night installers buy a business license and call themselves irrigators.

The signs for the summer are not encouraging. "Water levels are down and the weather trends are not good," says Bare. There's plenty of water in Atlanta, he says, but distributing it is the problem, since counties don't have the pipelines or reservoirs needed to supply it.

The best defense

"In order to be heard," insists Pogue, "we must first demonstrate true concern, not just engage in vocal drum beating. We must recognize some identifiable and important economic base or constituency, as well as other interests that could be either allies or are parties to be opposed."

The best defense is to form a green industry coalition of all irrigation, turf and landscaping contractors, nurserymen and of every entity involved in productive agriculture that requires irrigation.

After that, one can only hope that the spirit of compromise visits itself equally upon both houses, with worthwhile results. **LM**

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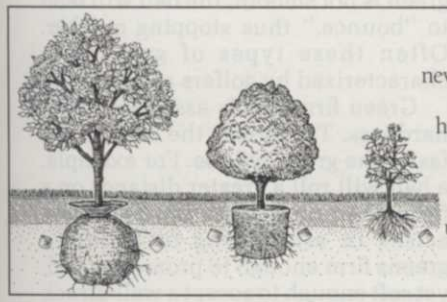

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The best managed greens offer golfers a happy medium. They're not too slow to take away from the fun of putting, nor are they too fast that they make it easy to sink a long one.

NO SPEED LIMIT

Despite what club members might say, there's more to a quality green than speed. Here are some management tips to keep your greens looking good.

by Karl Danneberger, Ph.D., The Ohio State University

The word "fast" has become synonymous with success. Fast cars, fast track careers, even fast food are associated with the good life. Speed has also become an important factor in sports. Baseball pitchers are evaluated on how fast they throw and football players on how fast they run the 40-yard dash.

In golf, successfully managed greens are often associated with speed. However, speed alone does not make for a good green. If a wide receiver cannot catch a football, his time in the 40-yard dash is meaningless. The same is true in golf: the ultimate fast green would be as hard as rock, smooth as glass and void of grass. I know of no golfer who would want to play on this type of surface. In this situation, the terms "feel" and "touch" would be meaningless since making a putt would be a function of luck. Clearly, green speed is important, but not the only component of a good putting surface.

Important elements of a good putting green are uniformity, smoothness, firmness and resiliency. Uniformity, smoothness and firmness are associated with green speed while resiliency is important in the green's ability to hold golf shots.

Uniformity implies that each green putts the same. Nothing is more discouraging than putting on a fast green followed by one that is slow. Uniformity is often difficult to achieve. Variation—such as location, construction, micro-environments and grass species—makes perfect uniformity nearly impossible. For example, greens may dry out at different rates or greens in the shade might putt faster due to thinner, less dense turf.

Smoothness is a major component of speed. The smoother the surface, the less resistance to ball roll. If a green is not smooth, the ball will tend to "bounce," thus stopping quicker. Often these types of greens are characterized by golfers as bumpy.

Green firmness is associated with hardness. The firmer the surface the faster the green will be. For example, a ball will roll a greater distance on a floor than on a mattress. Difficulty arises in attempting to maintain greens firm enough to promote speed, yet soft enough to accept a well-struck golf shot. Balancing these two aspects of greens management requires an understanding of your golfer's expectations.

In addition to uniformity, smoothness, firmness and resiliency, green contour is a major component for determining proper green speed. Speed is a relative term and what constitutes fast greens on one course may not be the same on another. For example, if two greens are each rolling nine feet

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measured by the stimpmeter (USGA measuring device) with one green being flat and the other severely contoured, the putting difficulty varies drastically. Speed measurements on contoured greens have a different meaning than on a flat green.

Managing greens for the proper speed is achieving a happy medium. Greens that are too slow are not fun to putt. Nor are greens so fast that they eliminate or diminish the skill level required of golfers.

Management strategies

Good putting greens have a number of components. To achieve fast, uniform greens, proper cultural programs need to be practiced. (Though top dressing and brushing may initially slow down a green, eventually they will increase its speed.)

● **Mowing height.** Reducing the mowing height will increase green speed. The lower mowing heights promote uniform and smooth surface. Often the question is asked: "How low can we mow?" A more proper question would be: "How long can we stay?" In other words, the lower you mow, the shorter the time interval at which putting greens stay healthy.

If you are considering purchasing groomers, first try them out to see if they will work in your situation.

The shorter you mow, the more likely the turf will become susceptible to temperature and moisture stress, disease pressure and damage through wear. Putting greens cannot be maintained at championship cuts for an indefinite period without turf loss or spending considerable money trying to prevent loss.

Care should be taken if mowing heights are to be reduced from normal cutting heights. A gradual lowering is advised. An abrupt change can result in scalping the turf which at low heights may result in turfgrass death.

Under non-stress conditions, if mowing heights are being lowered for a tournament, return to the normal height of cut when the event is over. Care should be taken if height of cut is to be increased under stress-type conditions. Research from the West and Southwest has shown that increasing the height of cut increases the water use rate of turfgrasses. In situations

The most important elements of a good putting green are uniformity, smoothness, firmness and resiliency, says author Karl Danneberger. "Fast" for its own sake isn't important.

where low mowing heights have been practiced, restricted root systems occur. By raising the height, especially under stress conditions, the root system may not be able to supply enough water to the additional tissue. In some instances, it may be best to leave the cut low until the stress period has ended.

● **Mowing frequency.** Frequent mowing promotes high shoot density and vertical leaf growth which results in smooth, consistent greens. Varying the directional mowing pattern daily helps promote a more upright plant. Research has shown that a break in regular mowing can result in a brief, yet significant reduction in green speed.

● **Double-cutting.** Double-cutting is a practice of mowing the green twice in one day. Research at Ohio State has found that double-cutting greens can significantly increase green speed. If pressure exists to increase the speed of greens, double-cutting is a viable option in place of dropping the height of cut.

● **Grain control.** Grain appears when grass plants lie down in different directions. Grain disrupts the uniformity of greens. In severe cases, shoots, stolons snd rhizomes orient in various directions on the surface of the putting green. The effect is to deflect or interfere with the golf ball's proper roll. Our work has shown that the difference between putting "with" the grain versus "against" the grain can vary as much as three feet with moderate grain present. Effective grain control is a prerequisite for achieving uniform greens.

Verticutting is a devise where rapidly-turning blades nick or cut into the top of the turf. This process helps reduce grain by promoting more upright growth and removing undesirable tissue. Verticutting is often done weekly during periods of active growth.

Brushing is a common practice for reducing grain. Brushing is the process whereby a stiff, bristle-type brush is placed in front of the mower. As the mower moves across the green, the brush lifts the turfgrass plant up before it is cut. Brushing is effective but can cause damage to the plant. The best time to brush is under conditions that promote turfgrass growth. Time interval between brushing depends on the severity of the brushing and how quickly the turf recovers. Avoid brushing if the turfgrass plant is under stress.

The groomer is a relatively new mowing devise available for greens management. It is similar to a verticutter that is placed between the reel and roller of the mower. The groomer stands the turf up before it is cut. In studies, we have found that groomers are effective for increasing green speed in situations where thatch levels are minimal. In situations of minimal thatch, we have measured as much as six-inch to one-foot increases in ball speed with the use of groomers.

In thatchy situations, the groomer did not effectively increase ball speed. With repeated use on thatchy turfs, damage did occur to the grass plants. As in all mechanical practices, grooming should be eliminated or reduced if the turf is under stress.

Groomers are an exciting new devise in managing greens. However, variable reults may occur due to factors such as thatch. If you are considering purchasing groomers, first try them out to see if they will work in your situation.

● **Thatch control.** Thatch plays an important role in green speed and quality. A small amount of thatch provides a certain amount of resiliency. However, excessive amounts of thatch disrupt the firmness and smoothness of the turf.

Achieving a desired green speed cannot be accomplished with an excessive thatch layer. Priority should be set to control or manage thatch at an acceptable level. Vertical mowing, top dressing, and coring are effective means of minimizing a thatch layer. They should be done as a regular maintenance program.

● **Top dressing.** Addition of top dressing material to greens smoothes the surface and provides a firmer surface base. Frequent top dressing is a positive step in providing a uniform turf.

● **Rolling.** Rolling was done years

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ago to increase the speed of greens by making them smoother and firmer. Rolling fell from favor when it was realized that surface compaction which inhibited water movement and root growth could occur.

However, in some situations light rolling is a viable practice for achieving speed without lowering cutting height. In situations where greens are constructed to USGA specifications or are constructed of sand, rolling is a feasible practice for short periods.

A study was conducted on a USGA-constructed green to look at the effect of rolling. With a rolling treatment equivalent to 70 pounds per square foot, we were able to increase speed without significantly increasing the soil's bulk density (Table 1).

TABLE 1

Effect of rolling on green speed and bulk density on a United States Golf Association constructed green

Number of Rolls (70 lbs./sq.ft.)	Green Speed (feet)	Bulk Density (g/cc)
0	7.7	1.41
10	8.9	1.43
20	9.6	1.54
LSD (0.05)		ns

Green speed was measured using a USGA stimpmeter; ns = not significant

Source: Karl Danneberger

Rolling is a practice that a golf course superintendent needs to consider carefully. It is not a practice to use on soils susceptible to compaction or in situations of high moisture. Rolling is best used infrequently and for specific tournament situations.

● **Fertilization.** A popular practice in attempting to increase speed of greens is to reduce the nitrogen level in an attempt to discourage growth. The feeling is less growth and a thinner, weaker plant provides less resistance to ball roll. The problem with this type of management is the turf is susceptible to wear, environmental stresses, disease and—a growing problem on low-nitrogen greens—moss.

We have found that moderate levels of nitrogen (3 to 4 lbs/sq.ft./year) have no appreciable effect on increasing or decreasing ball speed. For the vast majority of situations, nitrogen fertilization practices should be used to promote turfgrass health and not as a means of increasing speed.

Know your greens

The challenge to improving green speeds is knowing what practices will work for you and at the same time providing a visually appealing and healthy turf.

It is important to communicate with your golfers the fact that those fast greens seen on television have been peaked for that week and will not tolerate championship conditions for any period of time. And finally, for all the practices that are available for increasing speed, the environment plays the critical role in what you can and cannot do and what you can expect. **LM**

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Zoysiagrass growing underneath the shade trees at The Imperial Palace in Tokyo. While zoysia does not possess the shade tolerance of cool- season grass, zoysia tolerates shade well enough to maintain a beautiful cover on this 400-year old lawn.

THE SEARCH FOR ZOYSIAGRASS

There's no limit to what researchers will do to find zoysiagrass. And there's no limit to what zoysiagrass might do for you.

by Judy and Doug Brede, Ph.D., Jacklin Seed Company

Zoysiagrass, also known as Japanese lawngrass, is a warm-season creeping perennial native to the Far East. As a turfgrass, it is adapted to the transition zone of the United States. One would hardly expect to find zoysiagrass growing at a high elevation at the exposed top of a mountain.

"Zoysiagrass has been touted to be a miracle grass that's going to solve a lot of our problems, " says Milt Engelke, Ph.D. and plant breeder at Texas A&M, Dallas. "There has been an aura of mystery surrounding zoysia because it is very expensive, and thus not seen extensively."

Zoysiagrass evolved in the Orient, where until recently lawn care was unheard of. Although some species of zoysiagrass can have high seed-yielding capabilities, harvesting zoysia in the Orient is done largely by hand. Relatively little seed leaves the Orient.

Zoysia japonica is the principal species of zoysia grown for seed because of its seed-yielding abilities. It's known as Korean common in the United States. Korean common is very open growing and has a wide range of genetic variability. It has found use in interseeding into tall fescue to produce a four-season lawn mixture.

The vegetative varieties of zoysia on the market in the United States, Meyer, Midwest, Belaire and El Toro, are also zoysia japonica or japonica hybrids. They are vegetatively propagated and can be obtained in the form of sprigs, plugs, or sod, which because of their slow growth habit are very expensive. According to Tim Bowyer, Ph.D. at Southern Turf Nurseries, zoysia sod costs can be at least 50 cents/sq. ft. installed. With little seed available and sod so expensive, why would we even want to give zoysiagrass a second look?

The benefits of zoysia

Zoysiagrass has several characteristics that give it the potential to be an ideal, low-maintenance turfgrass. "At one time, I got gutsy enough to say that we were going to go tee to green in the southern part of the United States with zoysias," says Engelke, "and I think I can still stand on that." Engelke has tested zoysia germplasm at his Dallas research site which are adaptable to tee, green, fairway, and rough.

To elaborate on zoysia's positive characteristics, travel with us to a setting in the Orient where zoysia flourishes. The lawn surrounding the Imperial Palace in Tokyo was planted to zoysia an estimated 400 years ago. It did not have the advantage of man-made irrigation, fertilizers, modern mowers, weed control, or disease control. Part of the lawn is in full sun, and part is dotted with numerous large, very old shade trees. Yet under these conditions of ultra-low maintenance, this stand of zoysiagrass has maintained a beautiful, full cover for centuries.

This demonstrates the rugged, enduring qualities of zoysia, as well as

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its low maintenance requirements. Zoysia makes very efficient use of water. It can also tolerate salinity, both in the soil and in the water.

"Zoysiagrass is the most nutrient-efficient turfgrass we have," says Engelke. It needs very little fertilization to maintain a dark green, dense stand of turf. Zoysia becomes so dense that it crowds out invading weeds. Zoysia is also extremely wear resistant and has excellent traffic tolerance. It is very slow growing and low growing, requiring no mowing at all in certain situations.

On top of all of these attributes, for a warm-season grass, zoysia has excellent cold hardiness. The vegetatively-propagated varieties now on the market are very well adapted for the upper transition area, Tennessee through Maryland. Zoysiagrass has been successfully grown as far north as Wisconsin, Pennsylvania and upstate New York.

Nothing is perfect

After reading all these advantages to zoysia, you might say to yourself: What are the drawbacks of this grass? The problems with zoysiagrass stem largely from over-maintenance. We're so used to pouring fertilizer and water onto bluegrass or Bermudagrass, for example, that we tend to over-maintain zoysiagrass. This causes problems. Over-maintenance of zoysiagrass can cause excess thatch, disease problems, and scalping.

Leafspot and brown patch are two diseases directly related to excessive fertility levels. However, with the proper adjustment in fertility, these problems can be overcome. Rust can also be a problem with zoysiagrass in some parts of the United States, especially in the upper Midwest; but, again, culturally it can be minimized. According to Engelke, improved varieties, such as Belaire, have excellent rust resistance.

As with all warm-season grasses, zoysiagrass goes dormant during the winter months. Some people view winter dormancy as a negative characteristic. Engelke has another view: "Not everything in the world has to be green to be good!" Zoysia has a very pleasant golden winter color. Landscape architects actually take advantage of the natural winter color of zoysiagrass in landscape design.

Zoysia breeders are working to extend the green period of zoysia. El Toro, a vegetatively-propagated zoysia bred in southern California by Vic Younger, Ph.D., has improvements in fall and spring color.

Where and how to use it

Zoysia can be used anywhere that cool-season or other warm-season grasses are used: in home lawns, parks, cemeteries, roadsides, athletic fields, and golf courses. There are a number of advantages to using zoysiagrass on golf courses, for example. Zoysia can be used in fairway situations. The amount of traffic on the golf course will dictate whether zoysia is used alone, or overseeded with a cool-season grass variety. If a golf course has heavy traffic (300 rounds of golf per day) during the winter months when zoysia is dormant, then overseeding with a cool-season grass like tall fescue or perennial ryegrass is recommended. This is done because the dormant zoysia is not actively growing and can't recover from heavy wear.

But dormant zoysia can handle some traffic without overseeding. The contrast of zoysia's natural winter color can be quite striking on a golf course fairway. Zoysiagrass is not as aggressive as Bermudagrass and is easier to keep trimmed around sand

The slow growth and good root binding of zoysiagrass ensure enduring integrity around bunkers. It's golden winter color can be a striking sight on golf courses.

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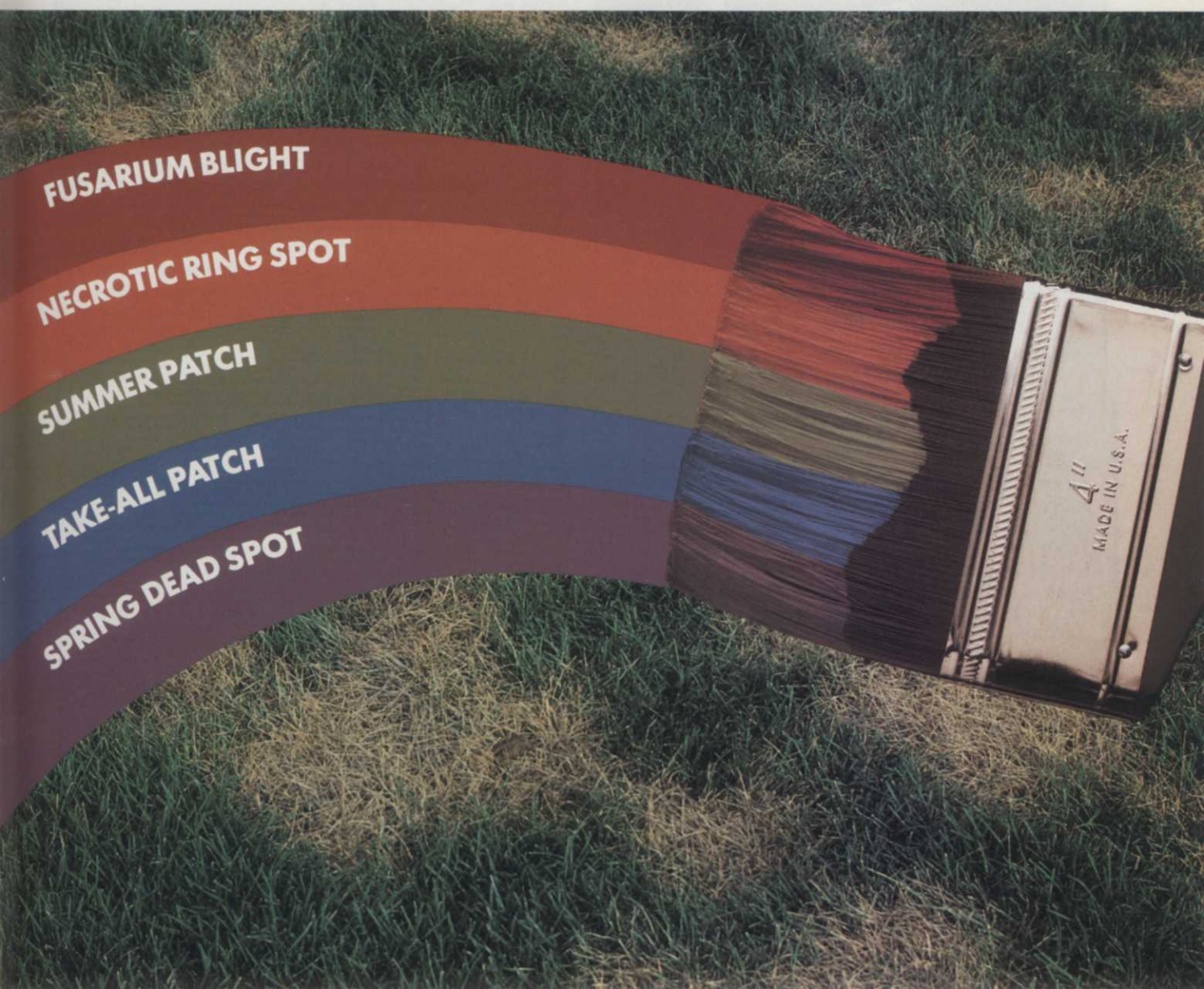

bunkers. Its slow lateral growth habit makes zoysia easier to keep under control.

Zoysiagrass can also be used to collar bentgrass greens. The golden winter color makes zoysia a very attractive alternative. One thing must be kept in mind, however, when using zoysiagrass as a collar: avoid over-maintaining the zoysiagrass when watering and fertilizing the green. Disease and thatch problems will arise if the zoysia is given putting-green level maintenance.

Bowyer recommends the use of a drop-type fertilizer spreader on greens with zoysia collars, to avoid over-fertilizing the zoysia. Zoysia is a good choice in the rough areas of a golf course. Because of its low growth habit, it can sometimes be left in an unmowed state on roughs. Some of the finer textured zoysia varieties, like Cashmere, a proprietary zoysia available from one sod source in Florida, can be used on both tees and greens.

Engelke has seen Cashmere successfully used on the tees of the Chi Chi Rodriguez Golf Course in Clearwater, Fla. "You are not going to stimp a 9, 10 or 11 on greens planted to zoysia, but it definitely is useful on a municipal course, or a course that doesn't have the championship putting on it that demands very high stimpmeter readings," says Engelke.

The general mowing heights for zoysiagrass are 0.3 to 0.5 inch on golf course tees; 0.5 to 1 inch on golf course fairways; and 1 to 2 inches in general

A quick look at an interesting grass

It often takes two years to produce a zoysiagrass sod crop, which is why it's an expensive commodity.

What is zoysiagrass?

Zoysiagrass, also known as Japanese lawngrass, is a warm-season, creeping perennial, native to the Far East. It has been grown in the United States since the 1940s, when it was introduced from Japan and China.

Like other warm-season grasses, zoysiagrass goes dormant every winter. But its yellow-white winter color is more pleasing than other warm-season turfgrasses. Furthermore, zoysiagrass possesses incredible cold tolerance for a southern turfgrass. It has been grown in Pennsylvania and parts of New York for many years with no winter injury. Unique strains of zoysiagrass from northern Japan are winterhardy clear into North Dakota.

How does zoysia spread?

Most strains of zoysia are slow spreaders, creeping about six inches laterally per year. Contrast that with Bermudagrass, which can creep six inches in a weekend!

The slow spreading of zoysia limits its establishment via sprigs. Sprigging is the most common method of establishing Bermudagrass, but it works poorly with zoysia because it's slow creeping. This slow spreading also makes for expensive sod prices.

What does zoysia sod cost?

Because of zoysia's slow spreading ability, it takes 1½ to 2 years to produce a sod crop. Bermudagrass, on the other hand, can sometimes yield two to four sod crops per year. Therefore, there's quite a difference in price. Zoysia sod sells for upwards of $1 per square foot installed—often more than the real estate it's planted on!

Tests at Southern Illinois University have shown that seeded zoysia can be established in as little as six weeks.

How delicate is zoysiagrass?

In trials at Texas A&M University by James Beard, Ph.D., zoysiagrass was the most wear-tolerant grass tested. Drs. Beard and Bob Shearman (now at the University of Nebraska) developed a wheel device that continuously rolls around in circles, wearing grass out. They timed the roller to see how many revolutions it took to wear out a certain species of grass.

Most cool-season grasses bit the dust in a few hours or days. Bermudagrass lasted a few days or weeks. With zoysiagrass, the wheel just kept turning and turning until they shut the machine off several weeks later. It never wore out.

What are its maintenence requirements?

Zoysiagrass is one of the lowest maintenance turfgrasses available. Natively, it grows only a few inches tall, so mowing is sometimes unnecessary. Zoysia needs little or no fertilizer after establishment and is incredibly drought-tolerant.

What about weeds?

Until a few years ago, there was no known disease of zoysiagrass. Now it is known that zoysiagrass will get many of the same turf diseases as other warm-season species. High temperature and humidity can occasionally bring on disease. Mostly, these diseases occur because the zoysia has been given too much care.

Where can I get zoysiagrass?

Jacklin Seed's JM-107 is the world's first and only proprietary, seed-propagated variety of zoysiagrass. It is moderately fine-textured and uniform, and medium dark green in color.

One source of seeded zoysia available in the United States is Korea common zoysia, which originates in South Korea. Because it is a common type, it is variable in growth habit. In 1988, the Korean government shut off supplies of this grass to America, which makes the little bit out there very expensive.

As far as vegetatively-propagated zoysias, Meyer zoysia has been a mainstay variety since it was released by the U.S. Golf Association Green Section in 1951.

Midwest zoysia was released from Purdue University in 1963, but has gained little use. Bellaire is a new variety recently released by Beltsville USDA. El Toro, a new release from University of California, has been gaining acceptance in the southern part of that state.

—Doug, Judy Brede □

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The discovery of zoysiagrass atop this arid mountain in Japan says alot for the variety's cold tolerance.

turf areas. "If properly cared for, zoysiagrass is an excellent alternative in many turfgrass situations," say Engelke.

In the past, the expense and limited availability of zoysiagrass has kept this super species from realizing its full potential in the turf industry. Turf breeders are working to change this with the release of seeded zoysiagrass varieties. Jacklin Seed Company will release its first seeded zoysia japonica variety, code named JM-107, in 1990-91. JM-107, in the seed increase stage presently, is a dense, uniform variety, with moderately fine texture, and a medium dark-green color. It is targeted for the same areas of use as the vegetatively propagated zoysia varieties. But a seeded variety can be established in a fraction of the time it takes for sprigs and plugs, and at a fraction of the cost. **LM**

Zoysiagrass makes very efficient use of water. It can also tolerate salinity both in the soil and in the water. It needs very little fertilization to maintain a dark green, dense stand of turf that has excellent traffic tolerance.

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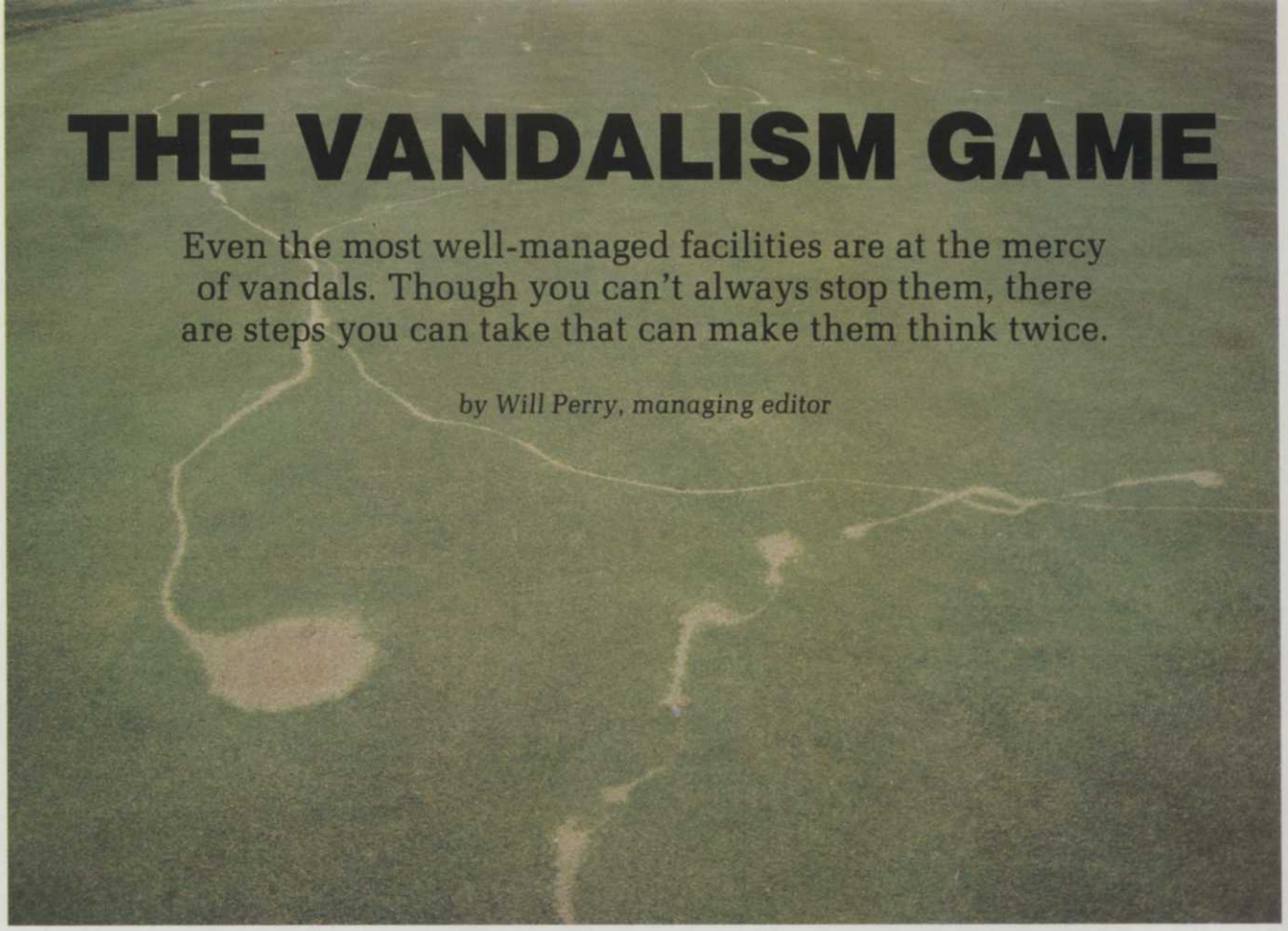
THE VANDALISM GAME

Even the most well-managed facilities are at the mercy of vandals. Though you can't always stop them, there are steps you can take that can make them think twice.

by Will Perry, managing editor



"A good vandal can really do a number on you," says superintendent Ed Wojtkiewicz. This green had oil spilled on it, which is especially damaging because it doesn't evaporate.

Did you hear the one about the kid, the jeep, and the golf course?

It goes like this: The kid was out partying and decided it would be fun to "turf" Princess Anne Country Club in Virginia Beach, Va. (The club, by the way, had just undergone a 16-month, $2 million renovation.) The kid was arrested and originally sentenced to two years in jail and fined $2,000. Eventually all but 10 days of his sentence were suspended on the condition that he put in 100 hours of community service, pay $1,050 in fines and court costs and pay the club $6,792.80 in damages.

The story sounds familiar to many superintendents and park managers, who know there's nothing funny about it. They also know that it's a one-in-a-thousand chance that the kid who "turfed" their course will ever have to pay for it.

It's sad but true that one individual with an attitude problem is capable of wreaking such havoc, easily ruining an entire season's work with the turn of a shovel or an opened oil can. The most frustrating aspect of this phenomenon is that there is so little you can do to stop it. The most effective deterrents to vandalism—fencing and lighting—are often too expensive for all but the most prosperous clubs. Still, there are steps the landscape manager can take to at least reduce the problem.

Enough is enough

After four incidents of golfers being robbed by gunpoint at Chickasaw Country Club in Memphis, Tenn., superintendent Jim Harris said "enough."

He changed the color of his full time and temporary employee's shirts from blue to red to increase their visibility. Caddies were given bright orange safety vests, which are numbered and tracked to make sure they don't fall into the wrong hands for the wrong reason. He also created a stencil of the course logo and had it painted on all apparel.

"The most effective thing we've done to reduce the crime here is to have everyone stay on the lookout for people who seem to be out of place," says Harris.

On any given day as many as seven Chickasaw employees are connected via high frequency FM radios. "We're not trying to apprehend anybody," says Harris, "We're just practicing prevention."

Harris added barbed wire to the fence that surrounded the course, including the "razor-ribbon" variety at a pregnable position beneath a railroad viaduct. Six months ago it claimed its first victim, an intruder who actually had to be cut free before going to the hospital to receive his 165 stitches.

The course had to sacrifice some of its privacy by clearing hedges from critical areas. "Many of the members complained, but we simply explained to them that it was either privacy or security. We chose security."

These efforts complement the work of full-time security guards who were put on line four years ago. For approximately $6 an hour ($50,000 a year), the course is privy to an unarmed guard who roves the entire course at least six times in a six-hour shift. He has a radio and a gas-powered cart equipped with flashing yellow lights.

"Since we added this additional security there has been a big drop in the number of incidents," says Harris. "If I were to recommend any measures, it would be that you get a security guard or an employee to roam the place at night. Equip a cart with flashing lights and a radio. That's usually enough to scare them off."

Many superintendents interviewed stressed that "scaring off" un-

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wanted visitors instead of apprehending them is the best way to approach the problem.

"We've tried a few times to press charges against vandals but always found that it was too difficult to pursue," says Ken Debusscher, of Wabeek Country Club, a private, 18-hole course in Bloomfield, Mich., about 25 miles north of Detroit. Debusscher has caught kids riding mopeds on the course but says that "my hands are tied" as far as what action he can take.

"We've found that if you tick them off they'll come back and do some real damage," he says. "I try to be as nice as I can so they have no reason to return. Granted: it's a fine line where you can be a real jerk about it, but I try to straddle it."

Debusscher repairs moped tire track damage on greens by replacing the turf with bentgrass sod purchased from a local nursery. If none is available, a swath is taken from an obscure spot on a nearby practice chipping green.

Three years ago Ed Wojtkiewicz, superintendent at Cleveland Metroparks' Manakiki Golf Course, had an incident where gas and peroxide were poured all over a green. He made a strong effort to find out who was responsible, having park rangers go door to door at surrounding residences asking for information.

"We never did found out who was responsible," says Wojtkiewicz, "but we did see a drop in the number of incidents after that. We're pretty sure whoever did it got the message that we weren't going to tolerate stuff like that."

Many superintendents stressed that "scaring off" unwanted visitors instead of apprehending them is best way to approach the problem.

To repair gasoline or peroxide damage, Wojtkiewicz recommends cutting the turf low, top dressing, reseeding it and waiting for it to grow out. "Oil-based damage is the real problem," he says. "There's nothing you can do about it until it leaches out. Eventually gasoline will evaporate, but oil will sit there all year."

Never-ending war

If you think you have problems, talk to a superintendent of a course within a major metropolitan area, such as Brooklyn, N.Y. Only "Russian border guards armed with machine guns" could stem the tide of vandalism there, says a superintentent requesting anonymity.

"This is the Vietnam of golf," he exclaims. His 18-hole public course has more than 6,000 families, football and baseball fields as neighbors and hosts some 80,000 rounds of golf annually.

"There is so much vandalism here that for all intent and purposes it's impossible to fight against it. They knock down fences quicker than we can put them back up."

To repair motorcycle tire damage to greens, his most common problem, he brushes away the debris, topdresses and reseeds. Sod may be used during the growing season, but otherwise is rarely considered because "if the kids see something they can just pull right up they'll destroy it."

The course employees and patrolling park rangers constitute security personnel, though neither have the power to arrest. "The police here are pretty well jammed up trying to deal with the more serious crime. Chasing kids on motorcycles isn't a high priority," he says. It was decided not to light the course because it is too expensive and "they would just shoot them out with BB guns anyway."

The most serious incident occurred two years ago when a stolen car was abandoned and burned on a green, causing $8,000 damage. Tees and ball washers also take a beating. The superintendent at this course keeps many ball washers on hand particularly around the Independence Day holiday, when they have a tendency to explode.

"A lot of them get blown up that weekend," he says. "I try to put out the older ones at that time." At $200 apiece, he says he easily goes through $1,000 worth a summer. "We try to buy ones that don't explode so easily," he adds.

Interestingly, the superintendent says golfers complain more about having to use a temporary green than they do about a vandalized one.

"Our philosophy is that nothing of value can be left out overnight. Not a flag, a chain, nothing." he says. "We could easily spend $2 million a year repairing things, but then we wouldn't be in business." **LM**

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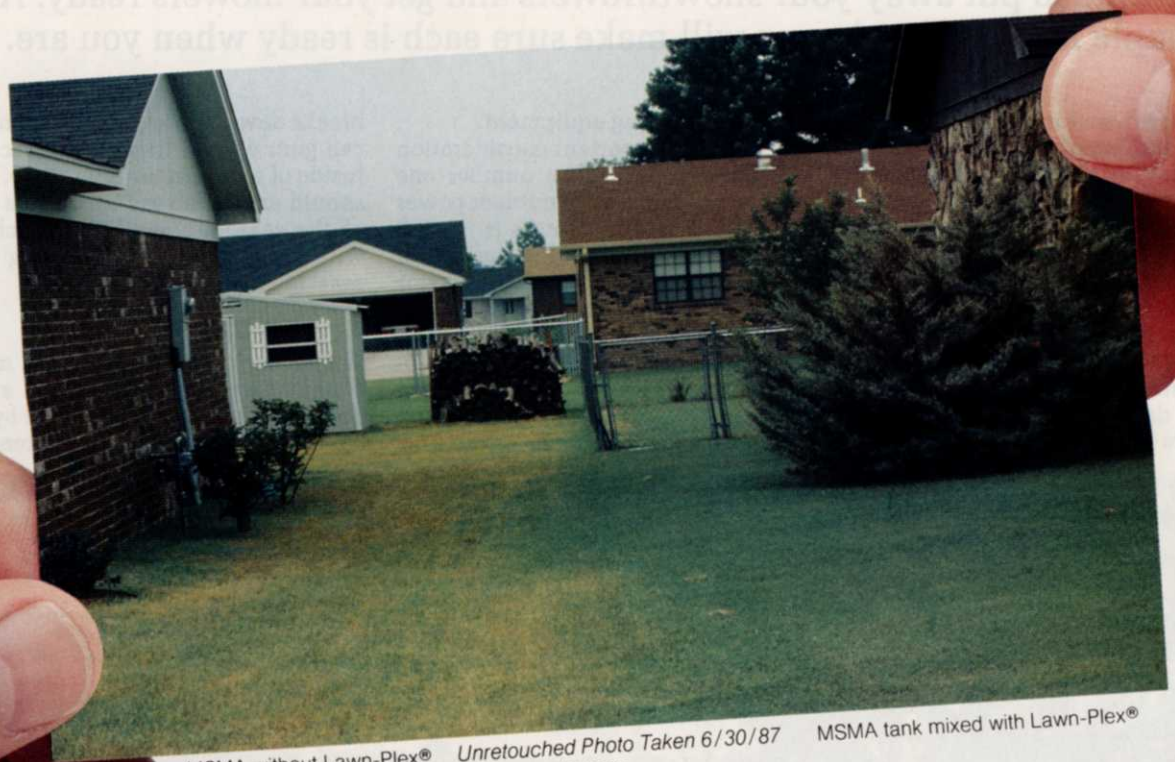

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Early spring is the perfect time to circumvent both problems. Prepare your mowers for use on the same spring day you prep your snowthrowers for storage, and you'll ensure easy-starting equipment.

The most important consideration is fresh gasoline. "The number one problem recognized by outdoor power equipment service centers is gas left in machines during long periods of non-use, or old gas (gas left in a can for more than a season) used to fill the machine at the beginning of a new season," says Bert Thompson, Pro-Line marketing manager for the Toro Company.

"Because gas becomes stale and breaks down after a period of time, it can gum up and literally shellac the inside of a carburetor. Therefore, you should empty the gas tank at the end of the season, and fill the machine with fresh gas at the beginning of a season.

At the beginning

Before performing mechanical maintenance on any equipment, avoid accidentally starting the engine by detaching the spark plug high tension

To completely drain your snowthrower of gas, first empty the fuel tank according to the instructions in your operator's manual. Then, start the engine and let it run until it stops.

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wire.

If you have let your mower sit since the last time it was used way back last fall, you'll need to start with a thorough cleaning. Tip the machine on its side and remove any dirt or grass clippings by spraying the housing with a garden hose. Scrape out any grass that water will not remove with a wooden scraper. Touch up areas on the top and underside of the deck with paint to prevent rust or corrosion from forming.

This is also a good time to check the blade fastener and blade for general condition and sharpness. If the blade needs servicing, follow the blade maintenance procedure in the operator's manual, making sure the blade is balanced before re-installing and is properly tightened according to the manufacturer's specifications. Rotary lawn mower blades should always be sharpened only on one side, generally on the upper surface.

With the machine right-side-up, use a rag and appropriate cleaning solvent to clean dirt, grime and grass clippings from the external parts of the engine, shrouding and engine housing. Special attention should be given to the cylinder head fins and blower housing to make sure they are completely clean for proper air cooling.

Also service the spark plug. With the cylinder head clean to ensure that foreign matter does not fall into the cylinder, remove the spark plug and check for proper gap, replacing it if necessary with one recommended by the manufacturer.

Although it should be cleaned throughout the season, the air cleaner on a mower, rider, or tractor becomes dirty by the fall. Wash foam-type air cleaner elements in a solution of liquid soap detergent and warm water. After drying and saturating it with oil, squeeze excess oil out of the element and reassemble. Simply replace paper-type filters.

Check and tighten all nuts, bolts, and screws that may have been loosened from vibration. If any part is damaged, repair or replace it.

After making sure the crankcase has been completely drained, refill it with the recommended oil to the proper level. Take care not to overfill the crankcase as engine damage or starting difficulty may result.

Also, lubricate and grease other mower parts as recommended in the operator's manual. Replenish battery liquid in batteries that need fluid, and charge for the specified charging time before using.

Finally, refill a completely empty gas tank with fresh gas for the season.

If you have let your mowers sit since the last time you used them, you'll need to start by thoroughly cleaning them. Tip the machine on it's side and remove any dirt or grass clippings by spraying the housing with a garden hose. Scrape out any grass that the water will not remove with a wooden scraper.

The snowthrower

The most important step for prepping outdoor power equipment for storage is to empty the gas tank. To completely drain your snowthrower of gas, first empty the fuel tank according to the instructions in your operator's manual. Then, start the engine and let it run until it stops.

All snowthrowers are by nature shaken around a lot. Thompson recommends inspecting for loose drive coupling and other parts which can later cause expensive problems.

Thompson says you should lubricate the control linkage and other moving parts of the snowthrower before storage. The crankcase oil should be changed prior to each season, using winter-weight oil (10W, 10W30, or 5W20). Run the engine just before changing the oil because warm oil flows better and carries away more contaminants than cold oil.

You'll want to remove the battery before long periods of storage. Finally, Toro suggests covering the snowthrowers to protect them from dust and dirt and storing them in a clean, dry place.

"Your outdoor power equipment sits idle a majority of the time," says Thompson. "But when it's needed, you need to be able to depend on its immediate performance. That's why, in addition to regular maintenance, your best bet for preventing problems is to buy a quality product from a reputable dealer. A little care combined with a well-built machine will give you years of satisfying performance."

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IMPROVING ROUTING EFFICIENCY

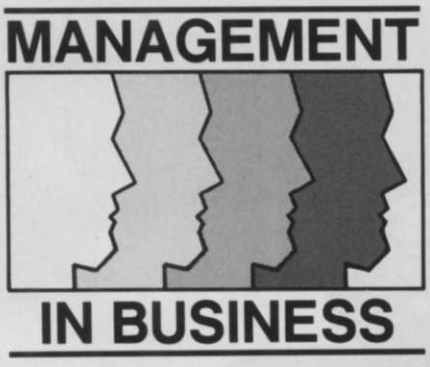
One of the easiest ways to lose money is to send crews out in a haphazard fashion. Routing should be fully planned ahead of time.

by Ed Wandtke

One of the best ways to control costs also happens to be one of the most overlooked aspects of doing business in the green industry: routing efficiency.

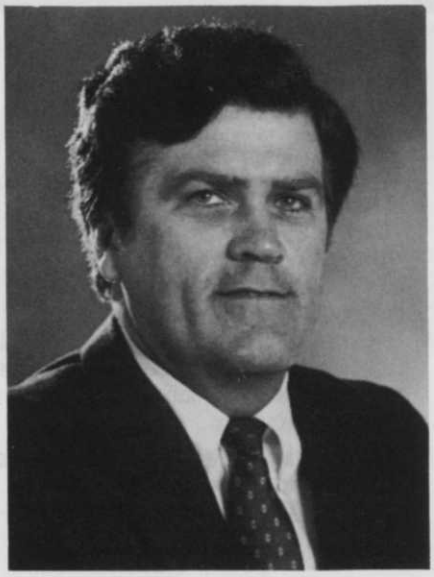
Routing is frequently delegated to an individual technician, serviceman or to a mowing crew chief. But the astute businessman needs to ask themself if this is the right person. What other options would provide better cost control, and how can your routing efficiency be improved?

Routing is the sequential servicing of customers on a given route. The traditional rule when developing a routing schedule has been to service commercial accounts in the morning and residential accounts later in the day, if time is available. But frequently a residential customer dictates the day and/or time that they want to be serviced. In many instances they insist you call ahead.



Who's in charge?

Routing should be done by an individual who understands the priority of your accounts. And though it's important that this person has an understanding of the layout of your service area, the actual deliverer of service rarely is the ideal person for route planning.



Ed Wandtke is a senior consultant with All-Green Management Associats in Columbus, Ohio. He focuses on operations and financial questions.

Some companies currently use a routing coordinator who sets the sequence of work to be performed each day, thereby allowing service personnel to concentrate on the customer. While this may seem to be a significant additional cost for some companies, you may be surprised how much time and payroll expense can be saved. I have seen this concept work for a company with as few as 10 service routes as well as for companies with more than 25 service personnel.

The routing manager usually has the additional benefit of knowing when work is completed each day. Therefore, if you're able to communicate to your service personnel, more work can be assigned to an individual or crew that finishes early. In addition, if you have customers who must be pre-notified, your office can call to confirm the service while your crew is enroute to the site. Such efficiency is sure to be noticed.

Figuring in growth

As your company grows, the need for an organized approach to servicing customers is critical to cost control. The rapid addition of new customers each year doesn't necessarily make your present routing plans obsolete. Customers signed up during the off-season should become the core of a grid network to be completed after new customers are added. It then becomes the routing person's responsibility to efficiently integrate new accounts into the daily production activity.

Many companies buy a grid map of their service area, identify the exact location of their customers, and map out what looks like a specific, efficient route. I have found that this system only works part of the time. A better approach for developing your routes is to buy a mylar (clear) film cover for the grid map and trace your customer locations on it.

Some companies need to narrow their service area in order to improve efficiency. Though saying "no" to that one account outside of a reasonable service area is difficult, it's more important to have stabilized routing. You need to bite the bullet and concentrate on solidifying the geographical area in which you will work.

The customer's eyes

Some of the computer software recently introduced to the lawn care industry features routing packages. Many of these systems are worth looking into. They are capable of saving you a significant amount of money, usually many times the cost of the software. Whether you choose to do the routing manually or with a computer, make sure that adequate room is left for inserting additional customers as opportunities arise.

To evaluate your company's delivery efficiency, look at your operation from a customer's point of view. Have someone in your company evaluate service delivery for your current customers.

Effective routing will save you money, but only if someone oversees the system. That's the route to improved profitability in 1989 and beyond. **LM**

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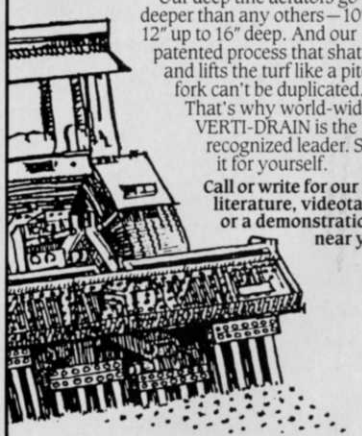

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JOBTALK

Inerts: the other ingredients

In any pesticide product, whether insecticide, herbicide, fungicide or rodenticide, there are two catgegories of ingredients. The first category includes active ingredients, the particular chemicals with active pesticidal capabilities. The second category includes inert ingredients, added to the formulation to help the active ingredient do its job, or to serve as a carrier.

The Environmental Protection Agency (EPA) defines inerts as "anything that is intentionally added to the pesticide product which is not pesticidally active." Inerts are used to increase the effectiveness of the active ingredients. For example, surfactants make herbicides stick to leaf surfaces better. In some cases, the inert ingredient is an emulsifier that helps keep the active ingredient in a liquid solution so that it can be spray applied.

Altogether, about 1,200 inert ingredients are used in pesticide formulations in the United States. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) contains regulations governing both active and inert ingredients. Currently, FIFRA requires that manufacturers conduct a full array of animal toxicological tests on the active ingredients in order to register a product. The tests are made to determine acute toxicity, the potential to cause birth defects, cancer and similar concerns.

According to Tom Hoogheem, environmental issues manager for Monsanto Agricultural Company, pressure has been put on the EPA to address this issue. "At present, only acute toxicity testing is required for inert ingredients," says Hoogheem. "That is prompting some people to ask questions concerning inert ingredients, since both product user and the general public could be exposed to the inerts as well as to the active ingredient."

As a result, EPA published a policy statement in the Federal Register on April 22, 1987. The agency's approach has been to classify the entire list of inert ingredients into four categories based on the chemical's known toxicity.

The first category includes some 50 chemicals, inerts of known toxicological concern. The second category includes about 60 inert ingredients that are believed potentially toxic because of their structural similarity to the substances in the first category. About 800 inerts whose toxicity is unknown are placed in the third category.

Substances were included in this group if there was no basis for listing them on any of the other three lists. The surfactant for Roundup is in this category. The fourth category includes approximately 300 inert ingredients of minimal concerns, such as cookie crumbs, corn cobs and water, the carrier in Roundup, as well as other substances generally recognized as safe.

The EPA requires registrants of many chemical products containing an inert ingredient to amend their EPA registration, adding the toxic inert ingredient to labels.

The first and second categories are obviously the ones that EPA gives the highest priority for additional testing. Any manufacturer with pesticide products on the market that include any of the ingredients in the first or second list will be asked to either find a substitute or agree to do substantially more toxicological testing.

The EPA is now requiring registrants of any product that contains an inert ingredient from the first category to amend their EPA registration and add the toxic inert ingredient to their labels. Additional exposure data, and in some cases, additional toxicity data may be required of many of these inerts. In addition, no new registrations involving these materials will be granted by EPA until further information can be provided.

This much activity is expected to raise the visibility of the question, "What are inerts and are they safe?" The issue of the toxicology of inert ingredients in pesticides deserves attention. The industry press will surely cover the topic, and even the public media will pay attention.

(Roundup uses water as a carrier, and the surfactant should not be of any concern.) **LM**

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That's where the Professional Lawn Care Association of America can help. PLCAA is the ProSource for over 1,000 businesses, large and small. PLCAA provides the benefits and resources you need regardless of the size of your company. Find out for yourself what so many other lawn care businesses have discovered, that PLCAA membership doesn't cost—it pays!"

JAMES R. BROOKS
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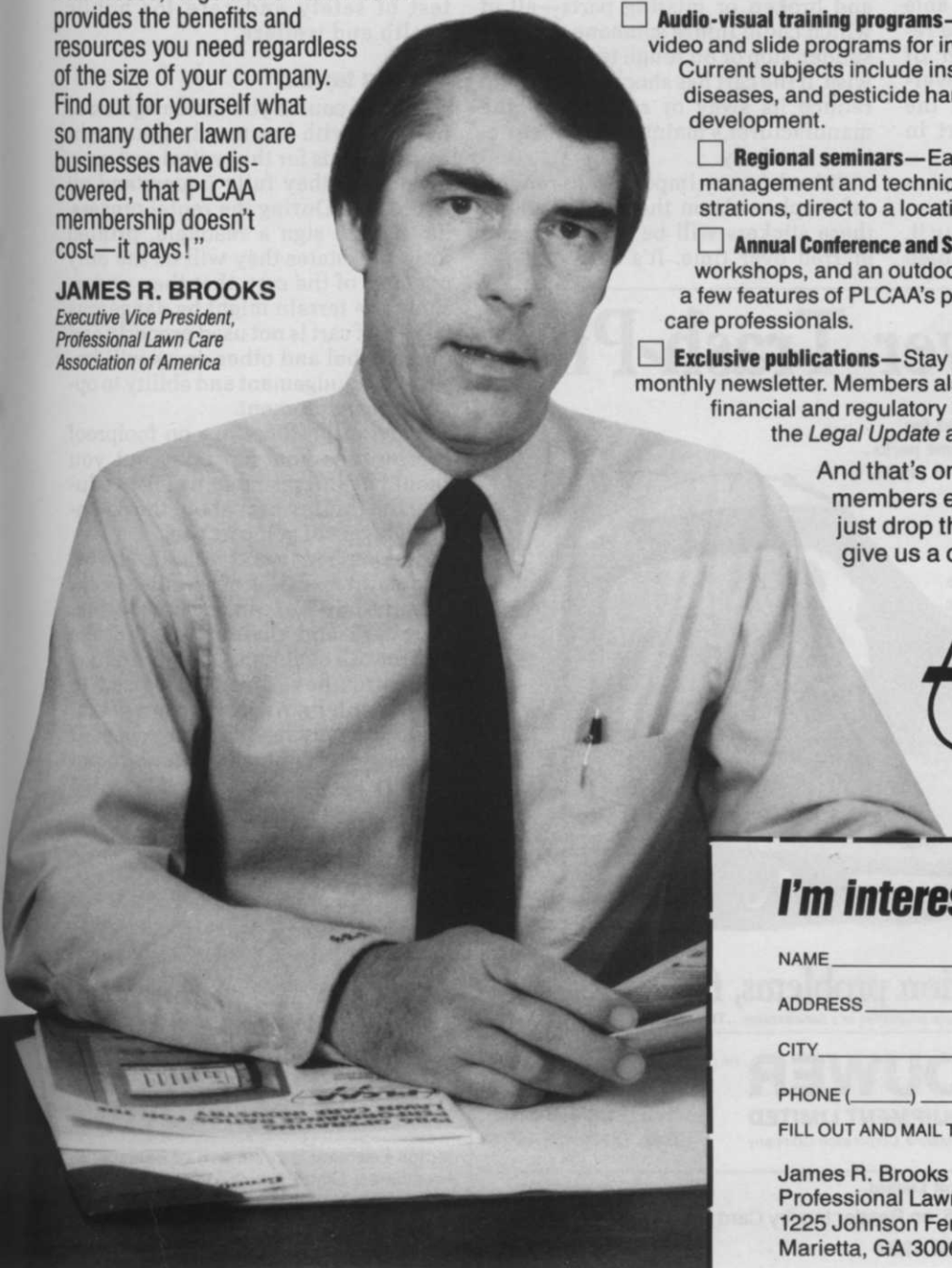

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Reducing liability from golf cart injuries

by James Leatzow, president, Leatzow & Associates

In this modern age it seems as though we take too many things for granted. Golf carts, as innocent as they may seem, are an example. These small, wheeled, mobile recreational vehicles hold the potential for significant lawsuits in today's litigious society.

If an accident occurs involving a cart, it's likely that the injured party will allege it was poorly maintained. Unfortunately, it's up to the owner/operator to prove that the vehicle had been properly maintained and serviced. To prove this, you must be able to provide bona fide maintenance records as well as some form of formalized procedure manual covering the scope and frequency of the work performed to the golf cart in question.

You will help your case immeasureably by requesting a cart's maintenance procedures when you buy it. You should then follow its scheduled maintenance to the letter. However, all of this effort is of little or no value unless you document and file records showing it—which should be standard procedure for virtually all golf course equipment.

Essential maintenance

Make sure that tires have enough tread to keep the cart from sliding on a slick or wet surface. Its pedals should be equipped with a rubber pad. Routine inspections should include checking for loose bolts, sharp objects and broken or missing parts—all of which could injure someone during a sudden stop or on rough terrain. Likewise, if the cart has shock absorbers to reduce its sway or roll, follow the manufacturer's maintenance instructions carefully.

It is also very important to replace safety placards on the carts. Though these stickers will be scratched and marred over time, it's still your responsibility to make sure they can be read at all times.

There are other dangerous exposures that aren't attributable to the cart itself. For instance, a cart path that passes by a steep incline with no safety fencing may lead to an accident. It is very important to make certain that cart paths and other areas where carts may be used are safe and free from dangerous situations. Golf cart paths that are properly maintained go a long way to show that your operations meet the test of safety and care for public health and welfare.

Posting terrain

If the golf course you are designing or involved with has terrain that might be dangerous for the typical cart user, make sure they fully understand all exposures. During the rental process, have them sign a readable, printed form that states they will be the only operator of the cart, that they understand the terrain might be dangerous if the golf cart is not used properly and that alcohol and other drugs will impair their judgement and ability to operate the equipment.

Obviously, there are no foolproof precautions you can take, but you should be interested in trying to educate the routine user about the potential dangers of golf cart use.

Remember that if you are drawn into court because of an alleged injury, the burden is on you to show that your carts and environment are safe and that all common sense dangerous exposures have been addressed to prevent injury. Anything short of that can ultimately lead to a large payout against your professional or general liability policy. **LM**

James Leatzow is president of Leatzow & Associates, Glen Ellyn, Ill. He specializes in green industry matters.

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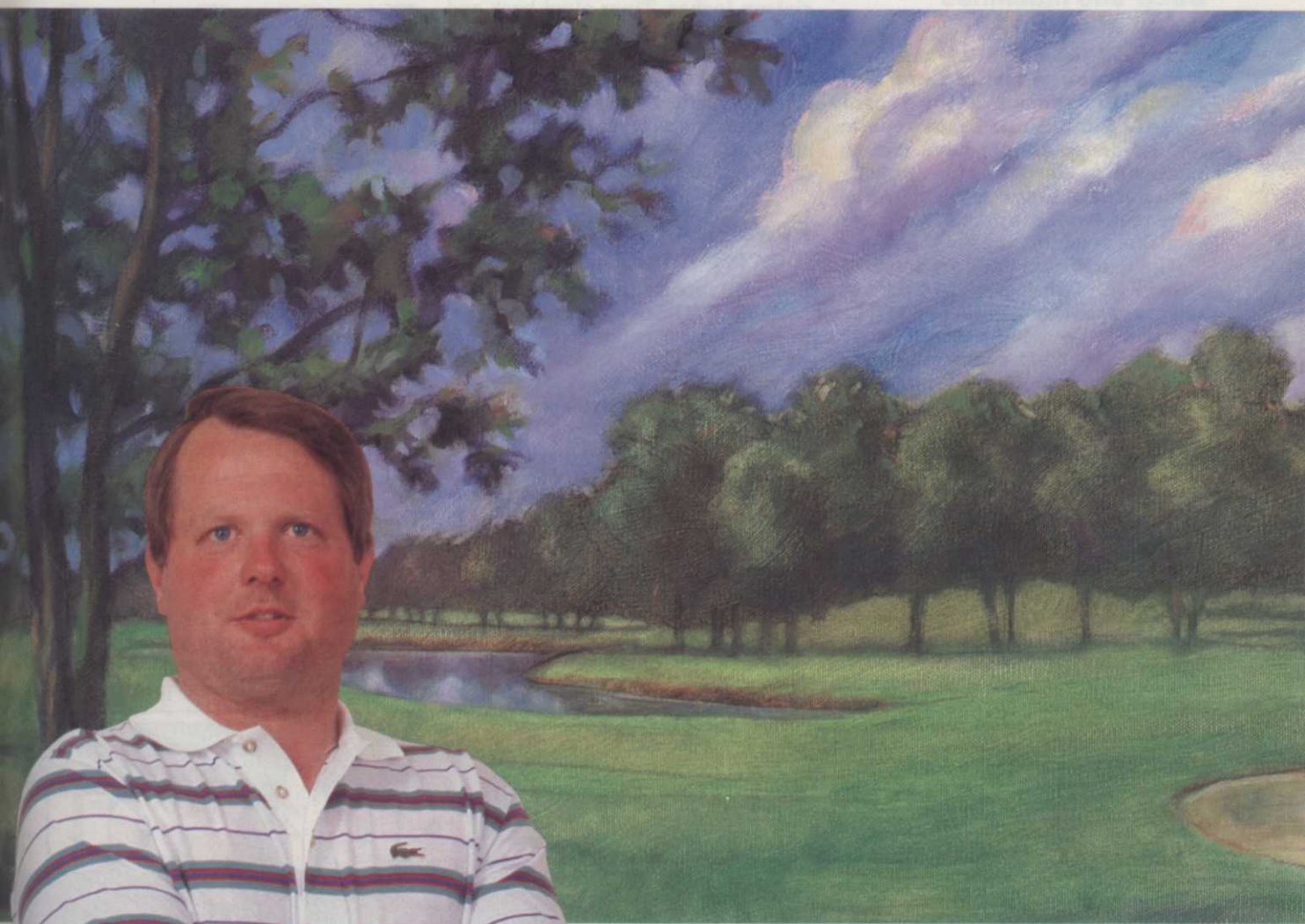

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Our homogeneous fertilizers are formulated with time-proven methylene ureas. So every granule delivers a constant, predictable release of plant food—giving you quick green-up, consistent growth and color *and* a residual base you can build on year after year.

For more information on our complete line of products, contact your local Lebanon distributor today. Or call our Greenline at 1-800-233-0628 or 717-273-1685.

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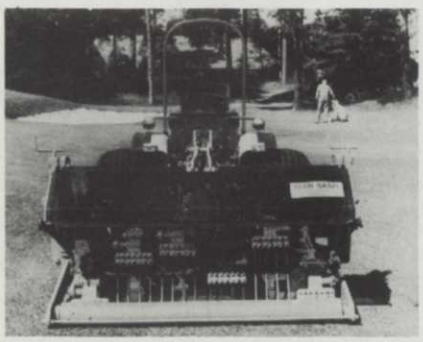
PRODUCTS

Deep-tine machines debut at GCSAA

The model 105.145 Verti-Drain Deep Tined Aerator is one of three new models introduced at the recent GCSAA show. Verti-Drain reports that its deep aerators have proven successful in alleviating the most difficult soil compaction problems, going more than twice the depth than other available aerators.

The Verti-Drain units are powered by the PTO of a category 1 or 2 tractor, and are capable of aerating up to four acres a day. Verti-Drain continuously drives solid or hollow coring tines into the soil to depths ranging from two to sixteen inches. Tines pivot back and forth, causing a "lifting" effect in the soil, and combines penetration through the soil pan for vertical drainage with the shattering effect of the compacted layers for thorough aeration.



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Power-take-off mowers for quality

Brouwer reports that its new transportable PTO-driven mowers give a fine, quality cut regardless of weather conditions. The standard Brouwer mowers with fixed mowing units give reliable and economic service, and can go the distance on long, tough grass.

Brouwer says the Fairway models have a unique floating mowing unit design that delivers an outstanding, quality cut, even in wet weather. All mowers are equipped with positive height of cut adjustment and optional quick height adjusters.

They are available in three-, five- and seven-gang units, manual or hydraulic lift and a choice of four- to eight-blade reels.

Circle No. 201 on Reader Inquiry Card

Nematode control product approved

A new product for control of plant pathogenic nematodes is called ClandoSan, from Igene Biotechnology, Inc.

ClandoSan has been given EPA unrestricted use approval for all crops, turf and ornamentals.

ClandoSan, reports Igene, is completely safe, non-toxic and non-soluble and its mode of action is indirect. ClandoSan is composed primarily of

Sonar® covers your ponds against weeds.

Sonar cleans your ponds and lakes of problem weeds such as milfoil, duckweed, hydrilla, waterlily and pondweed for one year or longer.

And Sonar won't harm the environment. No restrictions on swimming, fishing or drinking after application. Its selective control allows desirable vegetation to establish itself as habitat for water life.

Team™ covers your course against weeds.

Team preemergence herbicide lets you take a season-long vacation from weeds with split applications. Controls tough weeds such as crabgrass, goosegrass and suppresses oxalis and spurge. Without harming your turfgrass—even sensitive bentgrass.

You can either spread it straight in granular form. Or spread it on fertilizer available from leading formulators.

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Find out more. See your Elanco distributor. Or call toll-free: 1-800-352-6776.

chitin, which is derived from shellfish waste through a patented process. The chitin stimulates normal soil micro-organisms to produce enzymes, which destroy the nematodes and their eggs.

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Total turf aerator proven in field

Salsco has introduced the TTA-550 Total Turf Aerator, which brings together the proven technology of the

TTA-60-24 aerator and a comfortably efficient riding unit.

Powered by a 20-hp Kohler engine, the TTA is described as ideal for greens, tees, fairways, sports fields and other large turf areas. Variable core spacing from one to six inches enables the TTA-550 to aerate more than 60,000 sq. ft. per hour.

Tines are raised and lowered hydraulically and are driven by Salsco's patented "Camshaft Free-Floating Tine System." Hole spacing can be adjusted without stopping the machine.

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High-rotation sprinkler quick, covers lightly

Hunter Industries has introduced the I-42 sprinkler, designed "for irrigation situations where a fast, light application of water is desired."

The gear-driven model can be used for syringing golf greens and lightly irrigating clay tennis courts, skinned baseball diamonds and horse race tracks. According to Hunter, the sprinkler also works well to control frost.

Its 4-inch pop-up stroke incorporates all the standard features of Hunter's Institutional Series, including a safety-cushioned rubber cover, locking body cap, and slip clutch pro-

tected drive system. An interchangeable nozzle-stator set supplied with each sprinkler allows the discharge rate to be adjusted from 6.5 gpm to 25.8 gpm. The I-42 is available in 17

course covered.

Surflan® covers your ornamentals against weeds and grasses.

Spray Surflan directly over the top of your ornamentals. Without fear of injury.

It controls over 50 different weeds before they start, including crabgrass, oxalis, chickweed and prostrate knotweed. All season. For less than $3.00/1,000 sq. ft. Compare that to handweeding labor costs of $30-$50 for the same area.

Rubigan® covers your course against dollar spot, anthracnose and patch diseases.

Fusarium blight. Necrotic ring spot. Summer patch. Take-all patch. Spring dead spot. All patch diseases are difficult to tell apart, difficult to control.

Only Rubigan is labeled to prevent and treat all five. Not to mention nine other common turfgrass fungal diseases. So why take chances controlling only part of the patch disease problem? Rubigan gets them all.

Elanco Products Company, A Division of Eli Lilly and Company. Lilly Corporate Center, Dept. EM-455, Indianapolis, IN 46285, U.S.A.

fixed arcs of coverage and a full circle.
Circle No. 204 on Reader Inquiry Card

Colorful shrubs introduced for '89

Hines Nurseries has introduces five shrub varieties for the upcoming season.

Hines Gold is a cultivar selection of the popular evergreen shrub, Gold Spot Euonymus. It features pure yellow-gold leaves bordered with dark green margins.

Moon Bay (*Nandina domestica*) is globular in form, well-groomed and bright lime green color that matures to medium green.

Hines' Brazilian fuchsia (*Justicia rizzinii*) is a herbaceous evergreen covered with drooping tubular, one-inch flowers that are bright red and tipped with yellow.

Japanese Beauty Berry is a deciduous mounded shrub with arching branches, growing to as high as six feet. Metallic-purple fruit forms in late summer and remains in fall and winter.

The Duck Plant is named for its papery, duck-like seed pods. Narrow curved flowers measure about an inch in length and bloom a bright brick red from January to June, followed by the pale green inflated seed pods.

It grows to a maximum height of six feet.
Circle No. 205 on Reader Inquiry Card

Line-striper is self-propelled

The All-Pro is a new self-propelled line striper designed exclusively for athletic field marking. Newstripe reports the product's design enables you to line your field up to four times faster than current models.

Capacity is 12 gallons, enough for an average size football field. A 3-hp, air-cooled engine powers the All-Pro along its 26″ × 20″ wheel base. Four

interchangeable nozzles are available. Paint flow is controlled by a spring-loaded valve and hand lever.
Circle No. 206 on Reader Inquiry Card

Foam marker now for the turf market

A.D.J.A. Industries of Salt Lake City has designed a foam marking system specifically for the turf market to avoid overlaps and misses. No pumps or compressors are involved, thanks to a pre-charged cannister.

A solid state control unit sets spacing and mark length.
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Outstanding durability.

Exmark's complete line of tough 21″ mowers is better by design. Like every Exmark mower, these 21's are engineered, built and tested to endure years of rigorous commercial use. They stand up to the demands of 72-hour work weeks. Exmark guarantees it — with our two-year limited warranty.* For more information or the dealer nearest you, call today: **402-223-4010.**

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Continued on page 98

IF YOU COULD PAY TWENTY BUCKS TO LIVE TWO YEARS LONGER, WOULD YOU?

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Of course.

Yet that's pretty much the additional cost for an engine that outlives all others of its generation.

The Wisconsin Robin.

We've designed important components, like the automatic decompression system, with fewer moving parts. And greater size per part. Making the engine much better equipped to endure hardships, tribulations, and stresses without coming to an untimely end.

So in your search for equipment, make sure it has a Wisconsin Robin engine. And enjoy two extra years or so of productive, powerful life before you have to shell out several hundred dollars for a new engine.

For an extra twenty bucks, it'll seem like an eternity.

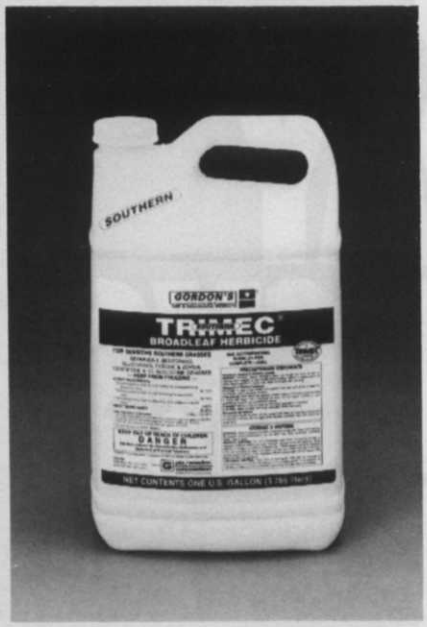
Wisconsin Robin

More power to you.

Circle No. 168 on Reader Inquiry Card

Herbicide available for many grasses

PBI/Gordon Corp. has introduced Trimec Southern, a broadleaf herbicide for use on Bermudagrass, centipede and St. Augustinegrass as well as zoysia, fescue and other turfgrasses.



The company says Trimec Southern is formulated as a high performance, post-emergence weed control treatment for 2,4-D sensitive grasses. At the recommended rate, one gallon covers up to eight acres of St. Augustine or centipedegrass at a matrial cost as low as $4 per acre, based on 1988 end user pricing. Cost and dosage for Bermudagrass are slightly higher.

Circle No. 208 on Reader Inquiry Card

Mower attachments can carry it all

Lawrence, Inc. has designed a new generation of rugged yet lightweight attachments for front-mount mowers and tractors with category 1, 3-point hitches.

You only need five minutes to change from a tote platform for transporting shrubs or fertilizer to a 12-cubic foot Hooper for hauling bark or debris.

Additionally the line offers an aluminum Hopper, Scoop and Tool Organizer along with a steel Fork Set and Tote Platform Bracket Kit. Quick release pins make for one-man installation.

Circle No. 209 on Reader Inquiry Card

Tree injector is safe, accurate, easy-to-use

The Davey Tree Expert Co. has developed a new four-point, CO_2-powered system to inject trees. The system is presently used in the utility and municipal arborcare market for injection of tree growth regulators. The injection system and material reservoir are self-contained in one easily-transported case. Features include minimal injection time, no manual filling or measuring for each hole, a closed system, reduction of daily cleaning and immediate priming system. Cylinders are easily adjustable for different injection rates.

Circle No. 210 on Reader Inquiry Card

New concept for pH meter-users

Cardy is a new, compact pH meter which provides quick, digital pH readings. Soil samples are placed on a flat sensor pad, which is a glass electrode system, with three or four drops of deionized/distilled water.

The Cardy liquid crystal reads 0-14 pH with a repeatability of plus or minus 1 pH.

Circle No. 211 on Reader Inquiry Card

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BOOKSTORE

010 - ADVANCES IN TURFGRASS PATHOLOGY
by Joyner and Larsen
Leading U.S. turf pathologists report on turfgrass diseases, pythium blight, snow molds, fairy rings, leaf spot of Kentucky bluegrass in Minnesota, initial and field fungicide screening, turfgrass disease resistance, etc. Contains new ideas on how to combat turfgrass problems. **$27.95**

235 - LAWN CARE: A HANDBOOK FOR PROFESSIONALS
by H. Decker, J. Decker
Written by turfgrass professionals, this handy guide will be invaluable for playing field managers, golf course managers, or any lawn care practitioner. Covers all aspects of turfgrass management. **$36.00**

645 - MANAGEMENT OF TURFGRASS DISEASES
by J.M. Vargas
Identifies turfgrass diseases by description and illustration. Includes a holistic approach to healthy turf and lawns. Presents practical management strategies for golf courses, lawns and athletic fields. 204 pages, illustrated. **$26.70**

620 - TURF MANAGEMENT HANDBOOK
by Howard Sprague
Practical guide to turf care under both healthy and poor turf conditions. Chapters cover turf in cooler and warmer regions, fertilizer use, regular turf care, weed and disease control and special turf problems. Useful seasonal schedules for management of turf areas. **$25.25**

220 - CONTROLLING TURFGRASS PESTS
by Shurtleff, Fermanian, Randell
New comprehensive guide provides the most up-to-date information available on the identification, biology, control and management of every type of turfgrass pest. **$36.00**

640 - TURF IRRIGATION MANUAL
by James Watkins
A guidebook for engineers, architects, designers and contractors. Keeps pace with the latest developments in turf and landscape irrigation. Specific chapters devoted to rotary sprinkler design systems. Golf course design systems and expanded engineering and reference material. **$27.25**

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110 - TURF MANAGERS' HANDBOOK-Second Edition
by Daniel and Freeborg
ENTIRELY UPDATED. A practical guide for the turf practitioner. Chapters on grasses, growth regulators and diseases have had extensive modification. Innovations resulting from research and practice have been added to reflect the current techniques available for turf managers. **$32.95**

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by Ilan Chet
Brings together alternative approaches and methods that have potential to control diseases caused by fungi, bacteria and viruses. Major concepts of disease control discussed include biological control systems, their possible mechanisms, potential application and genetic improvement. **$52.50**

800 - THE GOLF COURSE
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The first book ever to give the art of golf course design its due, and golf course architects the credit and recognition they deserve. 320 pages and 150 color and black and white photographs. Traces the history and evolution of the golf course, analyzes the great courses, shows how they were designed and constructed. **$35.00**

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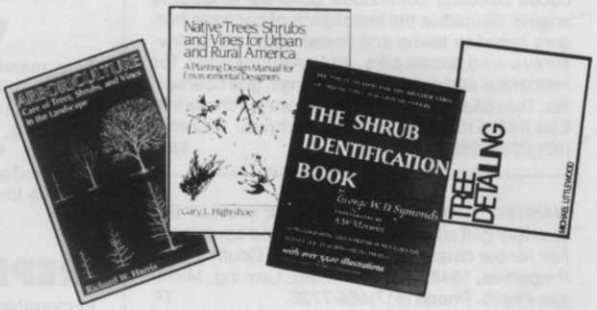
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Excellent salary and complete benefits. Send resume to Personnel Manager, 455 Watertown St., Newton, MA 02160.

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AQUAGRO® TURNS PROBLEMS INTO PROFITS.

Lawncare and landscape professionals all over the country are using AQUAGRO® soil wetting agents on their problem lawns. They're applying it on a regular basis to move water deep into hydrophobic and compacted soils, slopes and through thatch. And as a bonus they're seeing a dramatic improvement in overall turf quality, with reduced irrigation.

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Here's what three AQUAGRO users have to say.

Christopher Sann
Complete Lawn Service
Wilmington, Delaware

"I first used AQUAGRO about seven years ago on a bluegrass lawn with thatch-bound roots. Over a three year period I saw a 50-75 percent reduction in the thatch layer from the bottom; the roots penetrated the soil about three inches and I eliminated the hot-spots. About 90 percent of my customers are on an AQUAGRO program, which I often combine with verticutting. As tough as this summer was, the difference in appearance between treated and untreated lawns was obvious...and that keeps my customers happy."

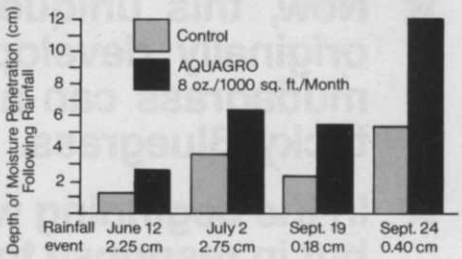
Joseph Broyles
Lawn Doctor of Oyster Bay-Syosset
East Norwich, New York

"The soils I deal with are heavy loam often with a compacted layer below the surface. AQUAGRO alleviates compaction by getting water to penetrate this layer. Eliminating standing water helps cure a major cause of fungus diseases...I've been offering AQUAGRO Liquid as an optional service for four years; recommending two, sometimes three applications a year. It's been a solution to a lot of problems, and in some cases helped set me apart from my competition."

Max Todd
Fairway Lawn Service, Inc.
Sunnyvale, California

"I am using AQUAGRO Spreadable on about 80 percent of my jobs. Drought conditions have made my customers more interested in products that can both reduce water use and keep their lawns alive. It's clear to me that the wetting agent increases the efficacy of fungicides, soil insecticides and fertilizers....I am able to sell the application as a companion to aerating and my customers recognize that the cost is offset by reduced water use and not having to pay for replanting."

Getting More Water to the Root of the Problem.



AQUAGRO moves even the briefest rainfall or irrigation deeper into the soil profile so less is lost to evaporation and run-off. Deeper water penetration also stimulates deep root growth for greater drought resistance.

The Difference Between a Good Lawn...and a Great One.

Discover why golf course superintendents around the world have used AQUAGRO for more than 30 years to solve their water related problems.

Used as directed, AQUAGRO is non-toxic to plants and animals and is biodegradable.

To find out how you can turn problems into profits and make your customers' lawns the envy of the neighborhood...and your competition. Call us.

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Circle No. 102 on Reader Inquiry Card

Introducing the ultimate

TRIMEC®

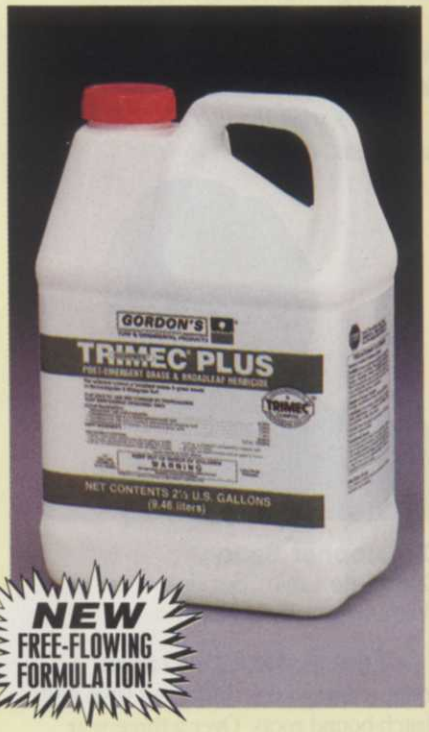
HERBICIDE

Post-emergent control of broadleaf weeds, grassy weeds, and nutsedge.

★ **Now, this unique herbicide that was originally developed for use on Bermudagrass can also be used on Kentucky Bluegrass.**

★ **In the beginning we called it Quadmec, but in response to popular demand we have renamed it Trimec Plus.**

★ **If you have never used this ultimate post-emergent herbicide, we want to send you a free sample. If you are already using it, we want to offer you a $100 value sprayer for only $35.**



Trimec Plus is a major breakthrough in post-emergent herbicide for ornamental turf. It not only controls the widest range of broadleaf weeds, including the toughies like spurge, oxalis and ground ivy — but it also controls grassy weeds such as crabgrass, barnyard grass and dallisgrass as well as nutsedge.

Furthermore, it achieves this control very economically. In most instances, only one treatment is necessary and the cost is only about one-third of what you would pay to use one of the other new post-emergent herbicides with a much narrower spectrum.

Everett Mealman
President
PBI/Gordon Corp.

What is Trimec Plus?

To understand the composition of Trimec Plus, it might be helpful to start off by saying that it is *not* merely a formulator tank mix of Classic Trimec and MSMA. Rather, it is a specially compounded amine complex of 2,4-D, MCPP, dicamba and MSMA . . . in a stable, uniform suspension that is as easy to work with as any other Trimec complex.

It not only has the synergistic and eutectic power of Trimec for controlling tough summer annuals, but the complex enhances the effectiveness of the MSMA so that in most instances only one treatment is necessary to eliminate crabgrass and nutsedge.

Trimec Plus was tested for several years under the name *Quadmec*, and was introduced in the South last year for use on Bermudagrass. The reports from users and researchers have been very positive. And why not! There has never been anything like it for the grooming of Bermudagrass.

Characteristically, the pre-emerge on Bermuda begins to peter out just about when the hot summer annuals are beginning to be a problem. The result is often a hodgepodge of all sorts of grassy weeds, broadleaf weeds, and nutsedge.

With a broadcast spray of Quadmec (now called Trimec Plus) groundskeepers soon found they could clean up Bermuda in one fell swoop.

New name and formula

But there were two problems. Number one, the original formulation

post-emergent herbicide

PLUS

YOUR GUARANTEE OF A TRIMEC® COMPLEX PROFESSIONAL QUALITY

had too much viscosity and required premixing if it was to be used in cold water. Number two, our friends didn't cotton to the name Quadmec, and instead kept referring to it as *that Trimec plus MSMA.*

Of course you know that when turf professionals talk, PBI/Gordon listens. So we totally corrected the cold water viscosity problem and we changed the name to Trimec Plus.

Now labeled for Bluegrass

Not surprisingly, the reports about Trimec Plus reached into Bluegrass country, and we were deluged with inquiries about using it for spot treating the rash of pre-emerge escapes that occur every year.

The good news is that Trimec Plus is now labeled for use on Kentucky Bluegrass. Just think what this can mean to you: a stable, easy-to-use, economical, single product that selectively takes grasses ouf of grass, while at the same time controlling the widest spectrum of broadleaf weeds and nutsedge.

Introductory offer

If you have never used Trimec Plus (Quadmec), we urge you to call or write us for a sample so you can see for yourself what this product can do for you. It controls more weeds in turf than any other commercially available herbicide in the world.

On the other hand, if you are already using Trimec Plus, we want to thank you by offering you a chance to receive a $100 value sprayer for only $35. For details, see the coupon on this page.

Call toll-free 1-800-821-7925
In Missouri, call 1-800-892-7281

Imagine! One post-emergent herbicide that controls broadleaf and grassy weeds and nutsedge.

This $100 Value Sprayer Is Yours for Only $35 When You Buy Trimec Plus.

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- **Four-gallon capacity.**
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- **Brass wand and nozzle. (Variable cone and flat fan).**

To get this $100 Value SP-1 Back-Pack Sprayer for only $35, Buy 2½ gallons or more of Trimec Plus from your distributor between now and October 1, 1989, and send us proof of purchase (a sales receipt). Limit one offer per customer. Delivered via UPS. No requests honored after October 31, 1989. Please include name, address and your check for $35. Mail to PBI/GORDON Corporation, P.O. Box 4090, Kansas City, MO 64101.

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P.O. BOX 4090
KANSAS CITY, MISSOURI 64101

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Circle No. 177 on Reader Inquiry Card

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LANDSCAPE SALES CONSULTANTS - Texas based landscape maintenance company seeking consultants with two years proven outside sales experience with industry related degree. Compensation, base + commission, car allowance, bonus programs and benefits. Reply to P.O. Box 446, Lake Dallas, TX 75065. 4/89

LAWN IRRIGATION POSITION: Progressive, well established firm (30 year) serving Macomb and Oakland counties, is seeking an ambitious and experienced crew leader familiar with installation of residential lawn irrigation. This includes the water tap, wiring of valves and clock, and setting the sprinkler heads in proper spacing. Must be able to run a pipe puller and oversee 2 laborers. Up to $30,000 Plus Benefits. Send resume to: Irrigation, P.O. Box 423, Algonac, MI 48001. 5/89

Commercial landscaping firm needs highly motivated foreman to take over newly created irrigation division. Excellent opportunity for responsible individual to develop divisions potential in the high demand Baltimore-Washington area. Call Steve at (301)850-6907 for more information. 4/89

ARBORIST - FIELD REPRESENTATIVE - B.S. degree preferred in Urban Forestry, Horticulture or related field. We offer Medical Plan, Profit Sharing, Savings Plan and Paid Vacation. Send resume with pay history to Ira Wickes - Arborists, 11 McNamara Road, Spring Valley, NY 10977. 914-354-3400, attention John. 4/89

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Circle No. 135 on Reader Inquiry Card

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87-79

Circle No. 106 on Reader Inquiry Card

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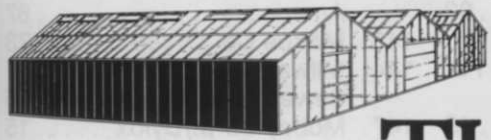

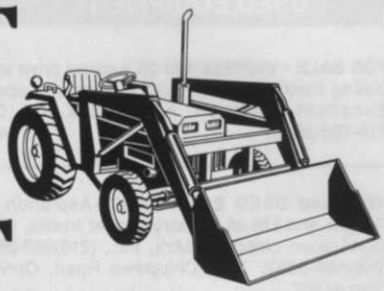

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NO.	ADVERTISER	PAGE NO.
101	Aglukon Agri-Products	34
176	Atwater Strong	98
102	Aquatrols Corp. of America	103
103	Barebo, Inc.	99
104	Berker-Underwood, Inc.	64
105	Brouwer Turf Equipment	92
106	Brouwer Turf Equipment	111
107	Brouwer Turf Equipment	45
118	Charles Machine Works, Inc.	14
119	Charles Machine Works, Inc.	16
120	Charles Machine Works, Inc.	18
108	Ciba Geigy Corp./ Pace	58-59
109	Ciba Geigy Corp./ Subdue (Regional)	100-101
175	Conwed Fibers	90
110	Cub Cadet Power Equipment	87
111	Cushman Motors	33
112	Cushman Motors	23
113	Ryan/Spotseeder	57
114	Deere and Co., John	2-3
115	Deere and Co.,John	28-29
116	Dixon Industries, Inc.	69
117	Dow Chemical Co.	24-25
121	Elanco Products Co./ Cutlass	46-47
122	Elanco Products Co./ Rubigan	35
123	Elanco Products Co./ Surflan	35
124	Elanco Products Co./ Rubigan	75
125	Elanco Products Co./ Sonar	75
126	Elanco Products Co./ Sonar	94-95
127	Exmark Manufacturing Co.,Inc.	96
128	Ford New Holland, Inc.	39
129	Foresight Products, Inc.	86
130	G.E. Mobile Communications	27
131	Goossen Industries	18
132	Grasshopper Co.	78
133	Gravely International, Inc.	41
134	Howard Price Turf Equipment	49
135	International Lawn and Power Equipment	109
136	Jacobsen Div. of Textron	63
137	Kawasaki Motor Corp.	77
233	Kut Kwick	53
139	Lebanon Chemical Corp.	93
140	Lesco Inc.	CV3
141	Lofts Seed, Inc.	CV4
142	Mazda Motors of America	67
143	Melroe Co.	73
144	Milwaukee Metro Sewerage Commission	85
147	Mobay Corp./Dylox	15
146	Mobay Corp./Dyrene	79
145	Mobay Corp./Nemacur (Regional)	91
148	Mobay Corp./Oftanol (Regional)	100-101
149	Mobay Corp./Oftanol	43
	Nissan Motor Corp. in U.S.A	20-21
151	Nor Am Chemical Co.	55
152	Northrup King Co.	17
153	Olathe Manufacturing, Inc.	70
154	PBI Gordon Corp./ Bensummec	51
155	PBI Gordon Corp./ Dyclomec	12-13
177	PBI Gordon Corp./ Trimec	104-105
156	Precision Laboratories, Inc.	34
157	RGB Laboratories, Inc.	83
273	Ransomes, Inc.	81
158	Rhone Poulenc Ag Co./ Aliette	31
159	Rhone Poulenc Ag Co./ Chipco	6-7
160	Rhone Poulenc Ag Co./ Sevin	89
161	Sandoz Crop Protection Corp.	71
162	Seirra Chemical Co.	65
163	Seirra Chemical Co.	115
164	Scott Proturf, O.M.	36-37
165	Spraying Systems Co.	19
167	Tecumsah Products Co.	26
166	Tee 2 Green Corp.	CV2
168	Teledyne Total Power	97
169	Telemark, Inc. (Regional)	113
170	Turfco Manufacturing, Inc.	22
171	Turfco Manufacturing, Inc.	22
172	Turf Seed, Inc.	5
173	Verti-Drain	90
174	Wells Cargo, Inc.	82

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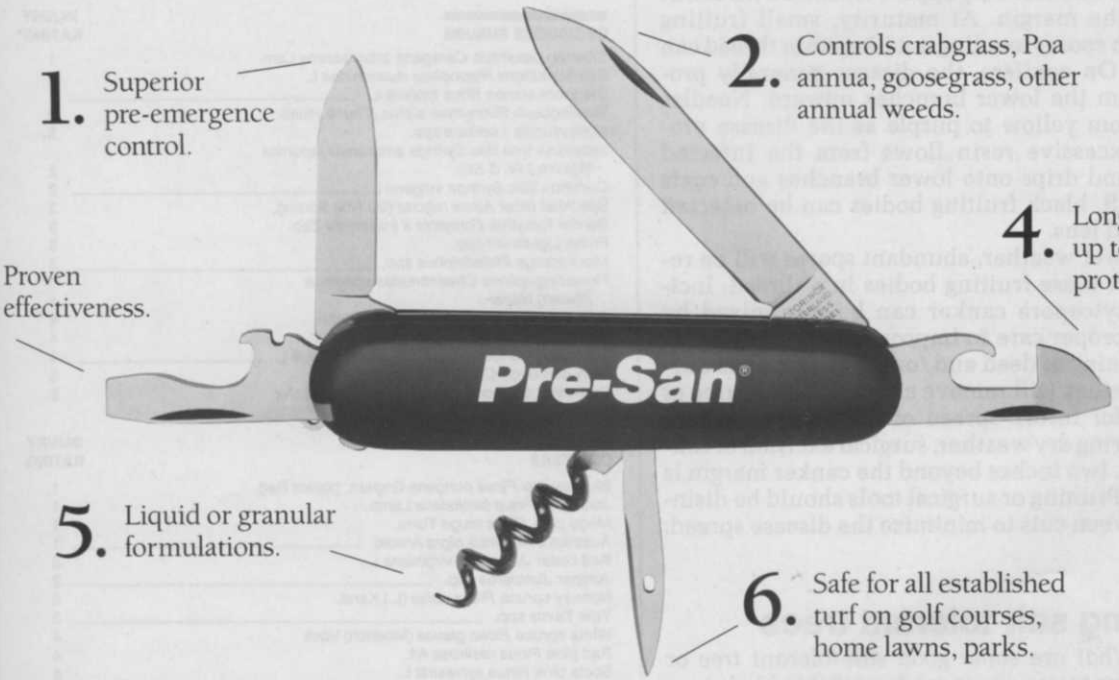

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PROBLEM MANAGEMENT

by Balakrishna Rao, Ph.D.

Replacing disease-infected trees

Problem: *We are dealing with a number of blue spruce trees planted in a row around house property for privacy. These plants are now severely infected with cytospora canker. They would like for us to remove them and replace them with either hemlock or Norway spruce.*

We are not sure whether it is a good idea or not. Would you please make comments on this as well as any other suggestions for future plantings. (New York)

Solution: Several different species of cytospora fungus can cause canker and/or twig blight disease on a large number of deciduous trees and shrubs as well as a few species of conifers. Mountain ash, maples, willows and poplar plants are the most common deciduous hosts to this disease.

Cytospora canker disease on blue spruce is caused by *Cytospora kunzei*. The latter species of cytospora is reported to cause canker disease on a number of conifers such as cedars, firs, hemlocks, larch, pines, blue spruce, Norway spruce and white spruce. Therefore, it is not a good idea to plant these trees in the same location.

This disease produces different symptoms on deciduous and on conifer hosts. On deciduous trees, elongate sunken cankers are produced on the trunk or branches, generally at a branch stub or mechanical wound. Cankers may appear cracked with callus ridges at the margin. At maturity, small fruiting bodies with spores exuding out like a thin thread can be found. On conifers, the disease generally progresses from the lower branches upward. Needles discolor from yellow to purple as the disease progresses. Excessive resin flows from the infected branches and drips onto lower branches and coats them. Small, black fruiting bodies can be detected with a hand lens.

During wet weather, abundant spores will be released from these fruiting bodies in a thread. Incidence of cytospora canker can be minimized by providing proper care to improve plant vitality. Selective pruning of dead and/or dying branches during dry weather will remove an important source of inoculum for future spread of the disease. Where feasible during dry weather, surgical excision of cankered bark, two inches beyond the canker margin is suggested. Pruning or surgical tools should be disinfected between cuts to minimize the disease spread.

Choosing salt-tolerant trees

Problem: *What are some good salt-tolerant tree or shrub species to use along roadways? (Michigan)*

Solution: The following list of plants obtained from a fact sheet entitled *Salt Injury to Roadside Plants* from the Ministry of Agriculture and Food, Ontario, Canada, might be helpful in dealing with the salt problem. Although the findings are for Canadian situations, it is likely that similar results will be obtained in your area.

DECIDUOUS TREES	INJURY RATING*
Norway maple *Acer platanoides* L.	1
Horse-chestnut *Aesculus hippocastanum* L.	1
Tree of Heaven *Ailanthus altissima* (Mill.) Swing.	1
Honeylocust *Gleditsia triacanthos* L. *inermis* Willd.	1
Cottonwood *Populus deltoides* Bartr.	1
Black locust *Robinia pseudoacacia* L.	1
Shagbark hickory *Carya ovata* (Mill.) K. Koch	2
Russian-olive *Elaeagnus angustifolia* L.	2
White ash *Fraxinus americana* L.	2
Largetooth aspen *Populus grandidentata* Michx.	2
Lombardy poplar *Populus nigra* L. 'Italica' Muenchh.	2
Trembling aspen *Populus tremuloides* Michx.	2
Choke cherry *Prunus virginiana* L.	2
Pear *Pyrus sp.*	2
Red Oak *Quercus rubra* L.	2
Mountain-ash *Sorbus aucuparia* L.	2
Amur maple *Acer ginnala*	3
Red maple *Acer rubrum* L.	3
Silver maple *Acer saccharinum* L.	3
Sugar maple *Acer saccharum* Marsh.	3
Paper birch *Betula papyrifera* Marsh.	3
Gray birch *Betula populifolia* Marsh.	3
Northern catalpa *Catalpa speciosa* Warder.	3
Quince *Cyonia oblonga* Mill.	3
Green ash *Fraxinus pennsylvanica* Marsh. *lanceolata* (Borkh.) Sarg.	3
Black walnut *Juglans nigra* L.	3
English walnut *Juglans regia* L.	3
Black willow *Salix nigra* Marsh.	3
Basswood *Tilia americana* L.	3
White elm *Ulmus americana* L.	3
Siberian elm *Ulmus pumila* L.	3
Manitoba maple *Acer negundo* L.	4
Allegheny serviceberry *Amelanchier laevis* Wieg.	4
Hawthorn *Crataegus* spp.	4
Apple *Malus* sp.	4
Crabapple *Malus* spp.	4
Mulberry *Morus* sp.	4
Peach *Prunus persica* (L.) Batsch	4
Weeping golden willow *Salix alba* L. 'Tristis' Gaud.	4
American beech *Fagus grandifolia* Ehrh.	5

DECIDUOUS SHRUBS	INJURY RATING*
Siberian peashrub *Caragana arborescens* Lam.	1
Sea-buckthorn *Hippophae rhamnoides* L.	1
Staghorn sumac *Rhus typhina* L.	1
Burningbush *Euonymus alatus (Thunb.)* Sieb.	2
Honeysuckle *Locicera* spp.	2
Japanese tree lilac *Syringa amurensis japonica (Maxim.) Fr. & Sav.*	2
Common lilac *Syringa vulgaris* L.	2
Speckled alder *Alnus rugosa* (Du Roi) Spreng.	3
Border forsythia *Forsythia x intermidia* Zab.	3
Privet *Ligustrum* spp.	3
Mockorange *Philadelphus* spp.	3
Flowering-quince *Chaenomeles speciosa (Sweet) Nakai*	4
Beautybush *Kolkwitzia amabilis* Graebn.	4
Bumalda spirea *Spirea x bumalda* Burv.	4
European cranberry-bush *Viburnum opulus* L.	4
Gray dogwood *Cornus racemosa* Lam.	5
Red-osier dogwood *Cornus stolonifera* Michx.	5

CONIFERS	INJURY RATING
Blue spruce *Picea pungens* Englem. *glauca* Reg.	1
Jack pine *Pinus banksiana* Lamb.	1
Mugo pine *Pinus mugo* Turra.	1
Austrian pine *Pinus nigra* Arnold	1
Red cedar *Juniperus virginiana* L.	2
Juniper *Juniperus* spp.	2
Norway spruce *Picea abies* (L.) Karst.	3
Yew *Taxus* spp.	3
White spruce *Picea glauca* (Moench) Voss	4
Red pine *Pinus resinosa* Ait.	4
Scots pine *Pinus sylvestris* L.	4
White cedar *Thuja occidentalis* L.	4
White pine *pinus strobus* L.	5
Hemlock *Tsuga canadensis* L.	5

A rating of 1 indicates no twig dieback or needle browning of conifers and no dieback, tufting, or inhibition of flowering of deciduous trees and shrubs. Ratings of 5 represent complete branch dieback and needle browning of conifers, and complete dieback, evidence of previous tufting, and lack of flowering of deciduous trees and shrubs. Under severe conditions plants rated 5 will eventually die. Ratings of 2, 3 and 4 encompass slight, moderate and extensive gradations of the above injury symptoms.

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